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THE MINERAL RESOURCES  
OF  
WESTERN AUSTRALIA.

Colvert  
VHF



THE  
MINERAL RESOURCES  
OF  
WESTERN AUSTRALIA. <sup>1</sup>

BY

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"RECENT EXPLORATIONS IN AUSTRALIA,"  
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1893.

E. P.

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TO  
*SIR JOHN FORREST, K.C.M.G.,*  
FIRST PREMIER OF WESTERN AUSTRALIA,

TO WHOSE CONSPICUOUS ABILITY, AND UNBOUNDED ENERGY,  
MAY LARGELY BE ATTRIBUTED  
WESTERN AUSTRALIA'S PRESENT PROSPERITY AND  
PROSPECTIVE GREATNESS,

I HUMBLY DEDICATE

**This Volume.**

*Printed Aug 20/21*



## P R E F A C E.

IN issuing the following pages, my chief motive is to set down, in the form of a small volume, a striking array of facts which now present themselves in connection with The Mineral Resources of Western Australia.

Until within the last few years her rich heritage from Nature was unknown, and indeed unsuspected. Few of her colonists knew anything about the vague rumours of Dampier and the Dutch having discovered gold in bygone centuries; and if such tales had reached their ears, they very properly paid little heed; but looked after their cattle and their crops. If haply, however, any imaginative colonist did cherish a golden dream, how amply has it been realised!

For my own part, I have endeavoured in a humble way, within the last few years, to see for myself some evidences of Western Australia's future greatness. I have made three visits to this colony for the purpose of exploring inland, and have travelled that portion of the North-Western district lying between Cossack and Mount Macpherson. On the first occasion I started from London early in April 1890, and



made the expedition at my own cost. Again, in April 1891, I was engaged by the General Exploration Company of London to make further investigations over the same line of country; and lastly, on the formation of the British Australian Exploration Company, I visited the North-West on their behalf. Then, from time to time, I have made a point of sailing to every port from Cambridge Gulf to King George's Sound—sometimes in regular coasting-vessels, and sometimes in small vessels which I hired for the purpose. From each of these ports I made journeys inland of varied duration, and with different objects in view.

Having been a pupil of John Calvert, geologist and goldminer, who found gold on the Ashburton as early as 1847, I have always had strong proclivities in the direction of mineral science; and I could not but coincide with his expressed views regarding parallel belts of auriferous country in Western Australia.

Upon one of these belts the Gascoyne, the Ashburton, the Murchison, and the Yilgarn goldfields have already been discovered. And there seems to be another parallel to the eastward, extending from the Dundas Hills on the south, up through Ullaring and the Kimberley range, past the head of the Ashburton River, and perhaps right up northward to Marble Bar and the Nullagine.

It almost takes away one's breath to contemplate the countless tons of unmined gold lying buried beneath the surface of a country which is twenty

times as large as England—possibly more than exists throughout the world in the form of minted coin. This, however, is mere conjecture, and can never be known.

Much, I fear, that I have set down will be looked upon as dry detail by the average reader. Gold-mining itself, I may remark, is dry work until the gold is found, when matters are liable to take an opposite complexion.

If I succeed in convincing a small percentage of my fellow-countrymen in the United Kingdom and elsewhere of Western Australia's mineral wealth, and enlightening a few readers as to its mighty possibilities, my task is done. My book is addressed to capitalist and emigrant alike.

I have had recourse to the reports of the present Government geologist, and those of the late Mr. Hardman, his predecessor. To the former I must express my acknowledgments, as likewise to various newspaper editors and correspondents, whose letters and articles have aided me in weaving together this unpretentious volume.

ALBERT F. CALVERT.

PICCADILLY CLUB, W.,  
*October 1893.*



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## INTRODUCTION.

IN these days when wars and rumours of wars disturb the world, and threats of armed rebellion are heard across St. George's Channel; when strikes and financial disasters scatter ruin and distress throughout our country—it is refreshing to turn our eyes to a British colony where peace and prosperity reign. I refer to Western Australia. Though vast in area, her population is but small; and, truly, she knows "the blessedness of being little." The money troubles originating in Victoria, and seriously affecting the older colonies and the United Kingdom, have left her unscathed. Her concerns have, doubtless, been small, but she has steadfastly attended to them, hence her banks have not had to close their doors.

Her early colonisation was marred by blunders and maladministration, and she started with the proverbial "bad name," which, when applied to the canine species, is said to be equivalent to a death sentence. Then her great unwieldy territory was a drawback. No one envied her the possession of tens of millions of acres, consisting of howling wilderness and waterless desert. Some

one gave her a nickname, and she is known as "The Cinderella of the South." Whoever fitted her with this most appropriate title, probably thought of her neglected brow-beaten plight, despised in her desolation by her showy colonial sisters: I scarcely think he anticipated the advent of either the fairy godmother or the handsome prince. But the story of Cinderella is being carried to its legitimate conclusion: obscurity is about to be replaced by wealth and fame, and the ragged gown by gorgeous apparel—in a word, Western Australia has proved herself to be a land of gold.

Now, there are many adventurous people of the nineteenth century to whom the very tranquillity of a country is unattractive, if not abhorrent. They enjoy the spice of danger, and prefer those lands where they may fall in with lions or tigers, or fierce anthropophagous savages. Still, even such ardent souls as these are somehow fascinated with the cry of "Gold"—the very synonym of wealth and power, not to be ignobly earned as wages or even salary, but taken at the point of the pick from the very fortresses of nature herself. Western Australia has developed this mainspring of power and pelf, and her goldfields will form the chief topic dealt with in the succeeding pages. She goes a step higher, however. In her watercourses precious stones have been discovered, and in the Conglomerate district, diamonds have been found. On her north-western shores, the pearl fisheries

have shown wonderful results. Silver has, likewise, been found, and an abundance of coal, iron, and the baser metals. Although subsidiary to her gold-diggings, these matters shall be duly noticed, in accordance with the title of this handbook, viz., "The Mineral Resources of Western Australia."

A perfectly straight line north and south divides Western Australia from the other colonies. It includes all that portion of the great Island Continent westward of 129 degrees east longitude. Its greatest length from north to south is 1480 miles, and its breadth from east to west 1000 miles. Two thousand miles of her sea-board is on the Indian Ocean, and 1000 miles of her coast is washed by the Southern Ocean. There are six land divisions, viz., South-West, Eastern, Eucla, Gascoyne, North-West, and Kimberley.

The South-Western Division is at present the most important, and by far the most thickly populated. It naturally subdivides itself into three sections. On the east, the line of river watershed separates the more settled neighbourhood from the wild interior; then the great forest lands, extending about fifteen miles from the sea; and lastly, the coast districts on the south and west. The Great Southern Railway runs from Albany to Beverley through the first-named section; the finest timber grows on the second, which is likewise rich in stream tin, while coal and other minerals only wait development. The third again is unrivalled as an agricultural settlement, besides



being the export outlet for the products of the whole surrounding district.

The vast Eastern Division is only partially explored, but is in many parts richly grassed, and suitable for raising cattle and sheep. This section, moreover, includes the Yilgarn goldfields, to which I shall refer at length hereafter.

Of the Eucla Division only a portion has been explored. It contains some excellent pasture-lands, and when the water difficulty has been overcome by artesian wells and other scientific resources, it will doubtless prove an advantageous field for settlement.

The Gascoyne Division is watered by several rivers, viz., the Gascoyne, Minglya, Murchison, Greenough, and Lyons Rivers. Horses, cattle, and sheep are successfully raised, and gold has been found in large quantities on the Murchison, Gascoyne, and Ashburton Rivers.

The North-Western Division is watered by the De Grey, Shaw, Coongan, Fortescue, Sherlock, and other rivers having their sources in the granite ranges of the interior. This is a very important grazing district, and here are the extensive Pilbarra goldfields.

The Kimberley Division, to the north of the colony, was one of the earliest explored regions. Here the climate is tropical, but it is rich in pasture-land, and its gold resources have been abundantly proved. Distance and difficulty of access have of course prevented its full development.

According to the latest computations, the total area of Western Australia is 678,400,000 acres, or 1,060,000 square miles. This vast tract of country, nine times the size of England, Ireland, and Scotland combined, has just reached a population of 60,000 souls, entitling the colony to an elected Upper House, in terms of "The Western Australia Constitution Act, 1890."

In order to impress upon the reader's mind the ridiculous disproportion of the inhabitants of Western Australia to their enormous territory, I have drawn out a few simple comparative statistics. The *argumentum ad hominem* is often a means of elucidation. England has an area of some 50,000 square miles, and is therefore about one-twentieth the size of Western Australia. If she were as thinly populated as her youngest colony in proportion to her area, she would contain about 3000 souls! Again, if Western Australia were populated as thickly as England, she would number over 500,000,000! Every square mile of England has about 485 inhabitants; seventeen square miles of Western Australia is peopled by one solitary being. If a tailor were really—as the adage would have us believe—the ninth part of a man, to one such fraction of humanity would be assigned some thirty-five miles of Western Australian soil. Let me here take opportunity, however, of pointing out that the "tailer" in question means one of the hangers-on at the "tail" of an army, nine of whom were supposed to be needed to make a man. Popular error

has erroneously and most unfairly fitted the proverb to the gallant knights of the shears.

Finally, I would observe that the British Empire includes 9,000,000 square miles. Western Australia's area is more than the ninth part of the entire possessions of Great Britain. Instead of owning the  $\frac{1}{9}$ th portion of the inhabitants, she has to content herself with the  $\frac{1}{8700}$ th part!

The older colonies are by no means populous, but they are crowded in comparison with lonesome "Cinderella." Victoria has about eleven to each square mile, New South Wales about three, Queensland one-half an individual, and South Australia rather more than a third.

Owing to the immense extent of this colony, it is impossible to speak of the climate generally. In the north we have the climate peculiar to the tropics. In the neighbourhood of the Gascoyne and Murchison Rivers there are heavy summer rains, and healthy dry weather for the rest of the year; while in the settled South-West Division the seasons may be divided into the wet, from April till October, and the dry, from November till March. During the summer months the north-west coast, between Ashburton and Roebuck Bay, is visited by cyclonic storms (locally called willy-willies), which do much damage.

Having dealt fully with the statistics of the colony in another work, I shall now proceed with the subject matter on hand, viz., The Mineral Resources.

Whether gold was actually found during the

sixteenth century in Australia, it is impossible to say for certain. Indeed, where and by whom the continent itself was first discovered is extremely doubtful. We can affirm with safety, however, that whatever navigator—whether Dutch, Spanish, Portuguese, or French—first landed on these shores, found himself on the coast of Western Australia; and all authenticated discoveries, such as that of Dirck Hartog, were made in this quarter. Its geographical position, which placed it nearest the Old World, and in the track of vessels, assured the colony of this pre-eminence. If the gold was found in Terra Australis or Java Major by any of the old-time voyagers, the nuggets must have been picked up in Western Australia. I myself have seen cartographic indications that the existence of gold was known or suspected in a Portuguese map of the sixteenth century, in which the western portion of the continent is marked with the legend, *Beach Provincia Aurifera* (the first word being a corruption of the word Loech or Lochac). For various reasons, however—the foremost being international jealousy—the truth concerning these early discoveries, whether of territory or treasure, is obscured by clouds of doubt and mystery. I will therefore pass on to a period of reliable history.

The old “travellers’ tales,” whether true or false, seem to have been utterly ignored by the early settlers in this colony, and it was not until 1840 that rich deposits of lead and copper were found in the Champion Bay district. Several very rich lodes

between Geraldton and the Murchison, and adjacent to the coast, were worked by English companies, in a raised belt of country extending from the Geraldton mine on the Murchison River in the north, almost to Geraldton in the south. The ores in these lodes usually consist of gallena (sulphide of lead) and cerussite, associated with quartz, calcite, barytes, and blende (sulphide of zinc). The gallena occurs massive and crystalline, and contains very little silver, any which is found being usually granular. Where cerussite (carbonate of lead) has been found, lead poisoning has been prevalent, having in some instances caused a stoppage of the works. Most of the old workings are now abandoned and full of water. There are some lodes, however, which have never been touched, and others that have been little worked. Although a railway was constructed 34 miles in length, from Geraldton to Northampton, these mines have been practically deserted for about thirteen years, the chief reason being the fall in prices of copper and lead. It is believed, however, that the lead mining industry would prove remunerative if proper smelting-works were established, and the Government offers a premium of £10,000 for the first 10,000 tons of metallic lead produced. A small local company was formed some time ago, but collapsed through want of capital, after producing several tons of excellent pig lead, and thereby proving the practicability of the scheme if adequately managed and supported. According to the Government geologist, lead ore

dressed up to 83 or 84 per cent. can be obtained in this district, whilst the coal seams on the Irwin River, about sixty miles distant, are quite suitable for smelting purposes, and there is an abundance of ironstone. Since 1845, when the first shipment was made, 7917 tons of copper and 31,105 tons of lead ore have been exported from this neighbourhood.

In 1846 the Messrs. Gregory found coal seams in the bed of the north branch of the Irwin, and Dr. Von Sommer, who reported thereon, soon afterwards stated that there were two seams of 6 and 8 feet in thickness. 2560 acres were declared, but nothing was done for many years; and although the authorities sent the Rev. C. G. Nicolay to make investigations, his report was such as to discourage investment. This field, such as it is, has now passed into the hands of the Midland Railway Company, who intend to test its true value.

Other minerals in vast quantity are hidden beneath the soil of Western Australia. Of this we have abundant proof, although the tiny army of prospectors and miners who have tried to test her mineral wealth could make but little investigation where nearly 700,000,000 of acres was the job on hand.

A few of the discoveries are as follows:—

Silver has been found associated with lead ores in the Northampton and Roebourne districts, and recent news from Perth reports the discovery of pure silver in the lode some eighteen miles from Southern Cross in the Yilgarn district.<sup>1</sup> Copper exists in large

<sup>1</sup> Recent advices from the colony contradict this report.

quantities in the Northampton district, also at Mullewah, Murgoo, up the Murchison, and near Roebourne; while at Whim Well there is an immense lode.

The Northampton district is rich in lead, which also occurs in smaller quantities near Roebourne. The Western Shaw and Pilbarra districts have produced tin. Iron is found throughout these districts, and one of the largest lodes in the world is in the Weld Range.

The Northampton district yields zinc.

Coal exists in many parts of the colony.

The Gascoyne River and Northampton district show the presence of graphite in considerable quantity. Mica exists near the Shaw and on the Gascoyne.

At the Nullagine kaolin has been discovered.

These facts, I think, bear testimony to the incalculable store of mineral wealth which Western Australia's hundreds of millions of acres may be supposed to conceal from the eyes of man.

Unwilling as I am to travel beyond the scope of mineral resources, I say a word on the first authenticated discovery of Australian gold.

John Calvert was born in Cornwall early in the present century, and to this fact may be attributed his early developed taste for mineralogy. When a child a kindly-hearted miner would show him how the stream tin was obtained, and point out here and there a tiny yellow flake and tell him that it was *gold*. Tin shaped the destinies of Calvert, just as

in bygone ages it shaped the destinies of all mankind. A moment's reflection shows how this comes to pass. The invention of bronze was the most distinct turning-point in human history. The Stone Age preceded the Bronze Age, but what inroad could the stone axe make upon the virgin forests of the world? Hard metal implied metal working, and brought about the arts of smelting, casting, and a hundred others.

Then see how it affected commerce and navigation. Bronze consists of copper and tin. Up till very recently there were only two parts of the world where tin could be procured in large quantity, viz., Cornwall and the Malay Archipelago. This necessitated a sea-going trade in tin, and first tempted the Phœnicians past the Pillars of Hercules, to brave the perils of the Atlantic. The basis of early foreign commerce, so far as England was concerned, was tin. I wonder, dare I yield to the fancy, that possibly this is why the term "tin" is familiarly used as an equivalent for money? May the importance of tin then excuse this short digression. It was, therefore, a purely local cause which added a taste for mineralogy to the ardour for exploration and adventure which John Calvert inherited from his progenitors.

When a boy of about thirteen he attended a sale at Stevens', where he was allowed to purchase some specimens exhibited by the great German mineralogist, Henry Heuland, and was likewise presented to him as a youthful enthusiast in this line of science.



This early acquaintanceship ripened into close friendship, and a few years afterwards he accompanied the renowned collector during several of his European trips. His attention was specially directed to gold-mining in Siberia and Transylvania, and on his return to England, he devoted his energies to experiments connected with the decomposition of gold quartz. He then wrote a book on "The Universal Distribution of the Metal Gold"—this was a most important turning-point, which led to his subsequent explorations—and, with the view of further establishing the theory he had enunciated, he sailed to Sydney in the year 1837. Here he discovered gold at Black Man's Swamp, near the Canobolas and Turon and Macquarie Rivers. After this he sailed to New Zealand, and found gold in the Middle Island, and finally he returned to Sydney, *en route* for England. Several works then issued from his pen, and in 1843 he journeyed to Adelaide, where he discovered copper and likewise gold.

He then went on to Sydney, and gathered a large amount of bullion, part of which he sold to the Sydney Bank. So little did they believe his story of having found it in New South Wales, that they bought it as South American gold. The Government were, likewise, incredulous, and Sir Thomas Mitchell, the Surveyor-General, wrote him a letter, in which he says, "We are a pastoral and agricultural community, and do not desire inducements held out for people to dig holes for our cattle and sheep to tumble into."

Having accumulated considerable wealth, in 1847 Mr. Calvert bought a brigantine of 240 tons. It was called the *Scout*; and with a ship's company of forty-two hands, he first visited Port Macquarie, Van Diemen's Land, to search the mountains there for gold, which he found. Subsequently, in the same year, he sailed for Exmouth Gulf, Western Australia.

The shadowy tales of old voyagers who had been driven by adverse winds on the desolate shores of Western Australia, gave hints of their having found gold in these wild regions. The old map-makers of the sixteenth century rang the changes between *aurifera* and *incognita* in naming *Terra Australis* in their atlases; and moreover, Mr. Calvert had formulated a theory that gold would be found in parallels running across Australia, and that the western parallel would be the richest. Recent discoveries are every day adding strength and confirmation to this doctrine.

The *Scout* cast anchor in Exmouth Gulf, and he disembarked his equipment, and unloaded his horses from that vessel and the schooner *Cloud*, which he had chartered. Then going inland, he discovered a rich tract of auriferous country on the Upper Murchison and the Upper Ashburton. Having brought away numerous specimens, he divulged his knowledge to several scientists of the day, including the Rev. W. B. Clarke, who wrote a book re-enunciating Calvert's theory of gold in parallels under the thin disguise of latitude and longitude.

Early in 1849 Mr. Calvert was again in London, where he endeavoured to float a company to work the gold-mines of Australia. Meeting with little encouragement, he formed an expedition on his own account.

John Calvert naturally found rivals in the field,—Hargreaves and others,—who sought to claim the title of first discoverer of gold in New Holland—nay, even more distinguished men were inclined to dispute the position he had taken up.

In his Presidential Address to the Royal Geological Society, in May 1844, which can be found in *Journal*, xiv., p. 99, Sir Roderick Impey Murchison, after pointing out the similarity of the rocks forming the great chain—running down the eastern side of Australia, and re-continuing into Tasmania—to those of the Ural mountains, speaks as follows: “But it” (referring to the Australian chain) “differs from the Ural and many other meridian chains in having as yet offered no trace of gold or auriferous veins.”

It is a notable fact, that in 1844 Mr. John Calvert sent home a small specimen of gold quartz, and a letter explaining to Sir Roderick how satisfactory his explorations had been with regard to Australia, in supporting his theories promulgated in his book entitled “*The Universal Distribution of the Metal Gold.*”

Again, in 1864, as may be seen in the *Proceedings* of the same Society (vol. viii., 1864, p. 32), a man named Hargreaves read a paper on the non-auri-

ferous character of the rocks of Western Australia. Sir Roderick occupied the chair as President. Here is the report of his remarks:—

“The President, in expressing the customary vote of thanks to the author for the paper, said, Mr. Hargreaves was the first practical explorer of gold mines in Australia. He had been sent out by Government to see if Western Australia would prove auriferous. He had stated what certainly was a fact, that he (Sir R. I. M.) never had the remotest idea of suggesting that Western Australia would prove auriferous; on the contrary, he knew very well that from what had been previously said of the structure of those rocks, and from the fossils and organic remains which had been brought before them by Mr. Frank Gregory, who had explored the country, that there were none of those ancient slaty rocks in the regions examined, with quartz veins in them in which gold could be discovered.”

From the first quotation it seems clear that Sir Roderick merely drew attention to a similarity between the rocks of Eastern Australia and certain other gold-bearing rocks in other parts of the world; and in the second he gives as his opinion that gold would not be found at all in this colony. Popular errors are hard to correct; but we have the testimony of the Rev. C. G. Nicolay, who was present at the Geological Society's meeting of 1864, and heard Sir Roderick's words.

Now, in 1853, Mr. John Calvert was the subject of fierce attack and insult at the hands of Professor

Sedgwick,<sup>1</sup> mainly based on the fact of Mr. Calvert not having passed through a college curriculum. But the Professor met his match, and both he and Sir Roderick came off second best in a sharp verbal encounter. John Calvert at once disclaimed the college blinkers, and challenging Sir Roderick's assertion, said that if the speaker's arguments were sound, what became of the Silurian system of Wales. Mr. Calvert went on to say, "Mr. President, although you have written much to prove the identity of the Welsh rocks with those of the Ural, still you have been silent as to their being auriferous." He concluded his speech by asserting that the Welsh rocks were extensively auriferous, and offered to meet Sir Roderick and his friends on the Welsh mountains, where he would point out rich veins of quartz.

This challenge was duly accepted. They met at Dolgelly, and Mr. Calvert took them to Clogau, broke gold from the rocks, and turned the tables on his scientific antagonists.

I now proceed to give a short account of each of the goldfields of Western Australia.

<sup>1</sup> This occurred at a meeting of British Association at Hull.

## DUNDAS HILLS GOLDFIELD.

THESE hills are a jagged range running nearly north and south, and about 120 miles north from Esperance Bay.

Two gentlemen from Melbourne visited these diggings last March, and began their journey by hiring a small cutter at Albany, in which they sailed to Esperance Bay. There they purchased six horses for pack and saddle, and otherwise equipped themselves. On the 28th February they left Esperance, and proceeded by the Fraser Range track, which, though a roundabout route to the Dundas Hills, is well watered. The direct line would have saved them fifty miles of travelling, but reports that water was scarce deterred them. Proceeding along the Fraser Range Road at the rate of twenty-five miles a day, at the end of the second day they reached Mount Ridley, where there is a permanent well of good water. Twenty miles further there are also tanks, which were sunk by the Dempsters for their cattle, and these also carried water. After four days they reached Clear Streak, at which point prospectors leave the Fraser Range Road, and strike westward towards the Dundas Hills. Up to Clear Streak the country is poor and sandy, covered with coarse scrub;

a few patches of feed being fortunately found among the rocks, which sufficed their horses till Clear Streak was reached, where feed was abundant.

The Dundas Hills are extremely rugged in appearance, and consist of bare rocks, timbered here and there in patches. On the side of the dry salt lake they have a cliff-like aspect, and many rocks stand out from the waterless lake-bed, through which run several well-defined reefs. These are wide, and seem to run regularly, the track leading into a gully which extends half a mile into the hills. Colours of gold have been got in these reefs, but little prospecting has been done as yet. The auriferous country is probably a narrow strip running north and south, and showing on both east and west sides of the hills, which are mainly of ironstone, with occasional glimpses of quartz. Several gullies intersect the hills, but do not exhibit alluvial, nor do the reefs seem rich enough for dollying. In short, this ground, although very promising, is not the place for the poor man or amateur, at all events until the advent of machinery.

The camping ground is at a soak in the gully, surrounded by hills. Here water was forthcoming during several months this summer, sufficient for thirty men and twenty-five horses, but at the time of writing it is nearly dry.

**Mawson and Kilpatrick's** claim appears to hold the premier position on the field, and lies about a mile and a half north of the camp. The owners have sunk a shaft on the reef to a distance of 33

feet and 4 feet wide. Last month they had at grass 45 tons of stone showing well throughout. At the 33 feet level gold is still showing freely on all sides.

**Bishop's** claim is at the south end of *Mawson's*;

**Currie's** is a mile south of the camp; and

**Alsopp's** in the same direction.

Another reef of good quality has been discovered at **Mason's** claim, about a mile to the north of *Mawson's*. The owners of the latter claim were, at the time of writing, in possession of some splendid specimens, and on their way to Albany, with the view of floating a company either in Perth or the other colonies. They complain sadly of the dearth of water, and until science puts forth her all-powerful hand, and conquers that awful demon *thirst*, strong arms and brave hearts are of no avail.

Here let me, as one who has suffered the pangs, say a word in parenthesis. My pen is weak in word-painting, or I would venture a description of the horrors which attend this agony of the desert. Enough that I have felt this unspeakable misery during my travels in the colony. I believe the Government are in earnest in regard to combating the only real obstacle to Western Australia's greatness among colonies, if not among nations. Let the water difficulty be met and overcome by the aid of highest technical skill, no matter what the cost may be.

The Cinderella of the South has heaps of gold in her "pockets," in her "seams"—nay, in her very "veins," to pay the bill, however large.



## YILGARN GOLDFIELDS.

THE Yilgarn Hills consist of a low range about 250 miles east of Perth, on the western side of a series of salt lakes, of which Lake Deborah is the southernmost. They run for the most part north and south, their width ranging from two to three miles. On the eastern side they extend, with gradual declivity, towards the lakes, being separated therefrom by a plain four to six miles wide, consisting of red clay strewn with ironstone and quartz.

The rocks are mica schist, mica slate, and flaggy quartzites, with many diorites and quartz veins. They have been tilted up from the west by a large mass of intrusive granite, which forms a rough face on the western side of the northern hills, and is again seen in the southern part, appearing above the plain in huge rounded masses. The quartz reefs follow the strike of the rocks, and show great variety of character, the white quartz being less clearly defined and in smaller masses than the more ferruginous reefs.

“Yilgarn” is the native name for white quartz, and the first discovery of gold in this district was

made by Mr. H. E. Anstey, at the end of 1887, at a place called Emun, about twelve miles north of Golden Valley. The next discovery was made at Golden Cross itself, a few months later. Then about the middle of 1888 gold was found some forty miles south, near the Central Mine in the Southern Cross district,—the latter place so called from its first discoverer having been led thither at night time by the help of the stars. In December 1888 Mr. Parker, guided by a native, made a further discovery some forty miles to the south-east, hence the name of Parker's Range.

Generally speaking the stone is rich, often containing six ounces of gold to the ton; and trial crushings have shown that a very large mass carries a remunerative proportion. Rich alluvial deposits have likewise been found, but scarcity of water has proved a series obstacle to progress. Plenty of brackish water, however, is obtainable, which by the use of condensers is rendered available for steam purposes. The conservation of the rainfall by the use of catch-dams, however, may yet supply the wants of the mining population for domestic and drinking purposes.

In 1889 the Government geologist reported as follows: "The water question has always been, and will always be, a serious one. Artesian water will never be obtained in the goldfield area, and boring for it is waste of money. Large reservoirs should be constructed in the beds of the lakes that are fresh, in which large quantities of water might be

stored, and should this become salt toward the end of the season, the remainder could easily be pumped out before the rain commenced.

“The water in the mines will, I believe, become fresher after heavy pumping, so there need be no fear of the future of the field being imperilled on account of the scarcity of water.”

Here is a cheery account from a correspondent last year bearing on the same subject:—

“SOUTHERN CROSS, YILGARN GOLDFIELDS.

“All anxiety as to the water supply for Yilgarn, and the road thereto, has been allayed for a space of at least six months, even if another drop should not fall during that time. A magnificent rain fell during the latter end of last week and the commencement of this—three-and-a-half inches in all—filling all the road tanks, the mines’ tanks, and the household vessels of the township to overflowing. Such a rain has not fallen for exactly three years. On that occasion the people were all scurrying off to avoid death by thirst. Beer was more easily obtainable than water, when down came such another thunderstorm as fell here last Sunday, bringing life and restoring hope.”

A recent telegram from Perth runs as follows:—

“PERTH, *Thursday, June 15, 1893.*

“The Government has let a contract to Mr. Rollo for deep boring at Southern Cross. The contract

provides that Mr. Rollo shall bore, if necessary, to a depth of 1000 feet, or until he finds water, the terms ranging from 15s. to 25s., according to the nature of the sinking. The bore will be at least six inches wide at the bottom. This should go a long way towards solving the problem as to whether water, salt or fresh, at considerable depths is to be found at Yilgarn or not."

At Southern Cross a small town has arisen consisting of tents, sun-dried mud, and primitive brick buildings with galvanised roofs. A few small hotels, boarding-houses, general stores, butchers' and bakers' shops, a bank, two billiard-rooms, a Church of England, and a miner's institute form the nucleus of what may yet be a populous city. Its affairs are administered by a warden and resident magistrate, and telegraphic communication has been established with the capital.

A line of railway is being constructed, passing through Northam, an important agricultural centre, which lies twenty-two miles north of York, and fifty-eight miles east of Perth. A considerable portion of its course will be over barren country, but it will open up a fertile well-watered area in the first fifty miles. The increased facilities of travel and reduction in freight for stores, machinery, &c., will doubtless prove of great benefit to the Yilgarn district, and lead to vast augmentation in its development.

Meantime, since these gold-fields have been opened up, the Government has vastly improved the road

leading thereto, and the coach-service from York is an excellent one.

When this line of railway is completed, it will form the first section of the great trans-continental system, which I hope will be an accomplished fact within the next few years.

When it is reflected that the cost of transport of machinery from the railway stations of York and Northam was as high as £19 per ton, though afterwards reduced to £16 per ton, it will be a matter of surprise that dividends were forthcoming, and it will readily be seen how the completion of the line will conduce to the prosperity of the Yilgarn gold-fields.

I do not purpose giving a description of all the claims in these goldfields. Many have been abandoned after short and inadequate trial, and in some so little work has been done as to forbid any conclusion being formed as to their prospects.

### SOUTHERN CROSS.

THE reefs in this district run more or less north and south, and it would appear that there are three lines of true lodes—one white, one ferruginous, and one mullocky with quartz leaders, and one series of cross courses.

These true lodes probably owe their formation to the upheaval which has occurred on the eastern and

western sides of this area to which they run parallel, while the cross courses are due to a later intrusion of granite, masses of which appear as bare separate hills.

The country is of slight elevation, consisting of low thickly timbered hills, flats, and claypans or lakes; the reefs generally appearing on the low ridges, but in some cases are visible on the edges of the lakes.

The rocks are chiefly hornblende schists, but micaceous, chloritic, and talcose schist occur, while both to the east and west metamorphic and intrusive granites appear, trap-dykes being occasionally found.

The four mines which are at present being worked are situated in one line of reef, the general description of the lode mass being a large interbedded lode, well formed in the deeper ground between two good walls, striking a little to the west of north, and dipping to the westward at an angle of some 80 degrees. This mass varies from 5 to 30 feet in width, but rarely consisting entirely of stone, especially in the larger portions, where a series of lenticular masses of quartz are met with. The rest of the lode is composed of broken country, intermixed with smaller veins and leaders of quartz. These quartz masses sometimes extend along the reef line for 100 feet, and on whichever wall they are met with, are generally rich in gold.

The stone has frequently a greenish appearance, being highly mineralised, and containing a small quantity of galena pyrites and chlorite.

**The Central.**—This claim has been taken up on a huge reef, traceable right along the whole area. The stone contains many minerals in small quantities, *e.g.*, galena, copper pyrites, iron pyrites (mundic), and chalybite (carbonate of iron). It has a shaft 265 feet deep, with a cross cut at 230 feet, where the reef has proved to be in width between well defined walls, and the stone exhibits gold freely. There was a fear that these reefs would pinch out at depth, which has happily not been realised. There is a bountiful supply of water in this mine, which will be increased when the level is extended through the granite to Hassell's shaft. There is stone visible which will last several years.

The property consists of 17 acres, and extends some 400 yards along the line of reef, employing about thirty men. An absurd regulation was made by the directors, prohibiting visitors from inspecting the underground workings of this mine unless under promise of furnishing the said directors with a written report of the mine. This policy was most unwise, especially when information is sought by England or the sister colonies, whose assistance in developing the goldfields is so essential. It is to be hoped that by this time the prohibition has been removed.

**The No. 1 Central Extended.**—On this claim a deep shaft has been sunk, which has been connected with the 120 feet level, and abundant water has been struck. At this level the lode is about 20 feet wide, three or four feet only being solid stone.

**Fraser's** lies at the southern end of the **Central** claim, with an area of 25 acres. A shaft is here being sunk to work the northern part of the lode, but in this portion of the mine no new ground has been developed. It was opened up three years ago in a very satisfactory style, with a shaft of 40 feet to water level and a level of 46 feet driven in the body of the reef. A large influx of water stopped progress. The lower level is now under water, but a good class of stone shows at the 60 feet level.

**Fraser's South.**—The reef here has been opened to a depth of 126 feet, where it shows a well-defined lode, showing gold about 8 feet wide at the northern end, but splits, and has not been traced at the southern end. The masses of stone dip south, and except at the north end are invisible on the surface. At the 60 feet level, however, the lode has been followed 500 feet. There appears to be no prospect of pinching out, and there is an abundant supply of water.

This mine comprises an area of 25 acres, in which a portion of the Salt Lake flat is included.

**Fraser's South Extended** I merely mention as having been floated as a syndicate in Adelaide. It adjoins Fraser's South, and shares with it a portion of the lake bed. Nothing indicates the existence of a reef, and it is not being worked at present.

All four first-named mines, it will be seen, are either engaged in sinking, or have lately sunk, deep shafts, from which the first true rock has been obtained, and it proves to be a hard hornblende



schist, possessing a slaty cleavage with partings of chlorite.

Here are four short telegraphic reports referring to the above mines respectively, which give an idea of the present yield. They are of last month's date (June 1893):—

MINE MANAGERS' REPORTS.

**Central G. M. Co. :—**

Southern Cross. "I cleaned up yesterday, and have just smelted 73 ounces from 200 tons stone. Crushed in time equal to  $5\frac{1}{2}$  days with 25 head. Mine looking same as last reported, having struck nothing new or rich."

**No. 1 Central Extended G. M. Co. :—**

"Crushed 63 tons stone, yielding 38 oz. 1 dwt. 12 grs. gold."

**Fraser's G. M. Co. :—**

"For the fortnight battery ran 20 head,  $9\frac{1}{2}$  days. Crushed 300 tons quartz, yielding 156 oz. 6 dwt. 12 grs. smelted gold."

**Fraser's South G. M. Co. :—**

"Crushed 460 tons for a yield of 207 oz. 14 dwt. smelted gold."

Before leaving Southern Cross, I may mention that A. C. Gregory, the explorer, almost reached

Southern Cross in 1846. Had he then discovered the riches so close to him, many pages might have been added to Western Australian history.

Mr. E. H. Halleck, of Adelaide, gives an interesting account of a visit to this locality in 1889. His remarks on Sunday trading are interesting and instructive. A short quotation from his pamphlet needs no apology, and can scarcely fail to appeal forcibly to the intelligent reader:—

“Sunday was passed very quietly, the wise and strict laws of the colony preventing anything approaching rowdyism on the Sabbath, the sale of intoxicants being strictly prohibited all over Western Australia on that day. As an instance of this the former landlord of the Exchange Hotel had just before my arrival to pay the sum of £50 for his kindness in dispensing a refresher to a friend on Sunday.

“Just another instance of what is done here in this connection, and is done well. If a man is proved, to the satisfaction of the presiding magistrate, to be an habitual drunkard, he (the magistrate) has the power of placing him on the ‘prohibited’ list for twelve months, and after so doing, as was done here recently, prohibitory notices are forwarded to the publicans relative to serving him with drink during that period, the penalty for so doing being the usual £50, and the effect in this case was that the expenditure connected with his maintenance in gaol was done away with, and the services of one of the best workmen in the district were

at the disposal of those who wished to employ him.

“The enactment of a similar law to this in older or more settled communities, differing as it does from say ‘Act No. 238 of 1881’ of South Australia, would have the effect of putting a stop to an immense amount of misery, and of relieving gaols, inebriate and destitute asylums, of a considerable amount at present expended on the class to which I refer, to say nothing of that incurred in relieving their unfortunate wives and families. After dinner on the Sunday, I partook of a piece of water-melon, brought hither by a Northam farmer, who was making hay while the sun shone, by engaging in the transport of goods consigned to the goldfields. That melon of which I partook cost 18s., at which price our host was glad to obtain half.”

**Blackbourne.**—This is a separate claim of twenty-five acres, and is included in the district of Southern Cross, from which it is distant about six miles, lying to the west of south from the Cross, and two miles west of the main belt.

The mine has been opened up by an underlie shaft to a depth of 275 feet, the reef being solid and well defined, from 4 to 5 feet in width all the way down. The quartz presents a fine appearance below water level.

The vertical shaft is down 265 feet, which is below the lowest level of the underlie. Fresh water, which at first appeared inexhaustible, is diminishing in flow, and turning salt. Soon after the main shaft

was sunk, 70 tons taken from pockets therein yielded 138 ounces of gold. The last report shows a crushing of 96 tons, yielding 128½ ounces.

Mr. Halleck, already quoted, seems at this spot to have varied the monotony of mine inspecting. After reaching the surface of the Blackbourne, he says—

“Here I saw a black boy throwing left-handed a piece of curved green bark not more than eight inches in length, quite as efficiently as I remember having seen the natives of the Adelaide tribe throw the same of wooden manufacture on the banks of the Torrens years ago. The distance traversed by the gyration of this piece of bark was something astonishing, and, like the boomerang of yore, it, after its aerial tour, always landed in the immediate vicinity of the thrower. Offering him sixpence to hit me whilst standing near him once in six times, I had a lively time of it, for on its return it only barely missed giving me a hard knock on each of the half-dozen occasions.”

**Hope's Hill** mine is about five miles north of Southern Cross, and consists of a large hill of white quartz. Gold was first found at the foot wall on the east side of the reef in a white magnesian clay full of quartz grit. On this side of the reef there is a mass of whitey-brown and greenish-blue banded clay, probably resulting from the decomposition of a serpentine rock full of small quartz leaders of a curious gritty nature. These leaders are, as a rule, rich in gold, and gold is also met with along the joints of the clay. The bulk of the reef is a white stone of barren appearance, though here and

there are bands containing more iron, and which yield a considerable quantity of gold on crushing.

Most of the recent work on this place has been done on the old Caledonian claim, as it is proposed to drive a tunnel quite through this area into Hope's Hill, so as to be able to convey the stone direct in trucks from the levels of the mine to the battery. There is an enormous lode formation, with shoots of stone, first on one side of the lode and then on the other. These, had they been picked, would have yielded good returns; but as it was considered more economical to crush all the load stuff taken out, the crushings have been low; but this system will cease when the great work of development is complete. No water has yet been struck in the mine, as the water-level is some hundred feet below the level now being driven into the hill.

Here is a recent telegraphic despatch referring to above:—

“PERTH, *June* 12, '93.—Hope's Hill, 450 tons for 155 oz. 9 dwt.”

### GOLDEN VALLEY.

THIS field lies about thirty-five miles to the north of Southern Cross.

**The Waterhall** is a comparatively small claim of irregular shape. The reef was discovered beneath the bed of a little gully, and a large *paddock* has

been opened on its cap, exposing a large quantity of stone mixed with bed rock. This stone is sometimes white, solid, and granular, but usually it is more like a gossan, and contains hematite, iron, copper pyrites, and chlorite. In the solid stone there is a good show of bright coarse free gold, and in the gossan and on the faces of the small ferruginous veins some fine specimens have been obtained.

A little to the south of the paddock a shaft has been sunk 40 feet deep, and cutting the reef at 24 feet. At the bottom of the vertical shaft, 32 feet down, a level was driven north and south, following the lode's course, and from this another 8 feet was sunk. The stone from shaft and level is similar to that on the surface, but less broken, and exhibits gold freely.

**The Kathleen.**—On this claim there are two reefs bearing gold—the one towards the eastern side being the first discovered in the field. This reef is so vertical that a shaft of 83 feet touches it almost all the way down. Its average thickness is 42 inches, though it only measures 12 at the bottom of the shaft. Another shaft has, I understand, been sunk higher up the valley, and glassy ferruginous stone raised showing gold freely.

For the last two years no development has taken place in either of these claims, the working being confined to getting out the stone already in sight. No water has as yet been struck in the shaft, the battery being run with water pumped up from a well at the bottom of the valley.

### PARKER'S RANGE.

ABOUT forty miles south of Southern Cross a rich deposit of gold was found by Mr. Parker, already mentioned. Upon the area of the pioneer mines are four auriferous reefs. Gold was in the first instance discovered by him in a surface-gutter, close to the site of the present workings, with leaders or stringers in near proximity.

There is an old German proverb referring to outcrops, viz., "There is nothing so good in mining as that which wears an iron hat." This is strongly exemplified in the case of Parker's claims, which are capped with ironstone more fully than in any other part of the Yilgarn goldfields.

By the most recent reports I see that, except in one instance, no development in depth has been undertaken on *Parker's Range* for the last two years. This one exception is the **New Macintosh** mine, in which the workings extend to a depth of 90 feet vertical, and 120 feet on the underlie. The lode is a solid, well-defined body of quartz, from 3 feet to 4 feet in width, and has been opened up by extensive levels, along which it remains settled until cut off by a granite bar. At the north end, through this bar, on the upper levels little stone was met with, but at the bottom a large lode mass appears to be well defined, as far as it has been opened, lying between two good walls, and consisting of a series

of large masses of quartz with mullocky partings. It shows gold freely in places, and is of a very promising character. It is highly probable that this is a different lode from that met with in the old workings, the country having been thrown to one side by the dyke. No water has yet been struck in this mine, but there will in all likelihood be plenty at depth. I will only enumerate a few of the other mines in this district, as there is at present nothing of special interest to report.

Adjoining Parker's on the west is the claim of A. K. Sewell, named, I think, **The Homeward Bound**, and measuring six acres.

To the south is A. J. Stewart's, likewise measuring six acres, named **The Throne**; and further to the south, adjoining, are **The Beaconsfield** and the **Beaconsfield Union**.

After a few hundred yards' interval, still further south, we come to **Vaughan's** claim of eight acres; and divided by the same distance to the southward are—

**Rickey's**—a claim of 15 acres. In this the first shaft is 47 feet deep vertical, at which point the reef and water were struck. In the drain from this point a junction of reefs was discovered at its commencement, and at 50 feet the lode at the end of the drive was 4 feet wide. No. 2 shaft was on the underlay, 50 feet in depth, the reef being 2 feet wide at bottom. The stone has exhibited gold in fair quantity.

Adjoining Rickey's to the south is **Counsel's**, con-



rising of 12 acres, and three quarters of a mile to the westward are three claims taken up by **Sivyer and Counsel**, measuring 12 acres, and two by **A. Counsel**, measuring 6 acres each.

About a mile south is **F. Sala's** claim of 8 acres, and adjoining to the southward is **Macintosh's**, measuring 18 acres, and **Hughes' and Groves'**, measuring 10 acres. About a quarter of a mile south is the claim of E. S. Mansfield, called **The Uphills**, which has a lode of 3 feet wide, 3 feet of which is gold-bearing stone. **The Star of Yilgarn** adjoins the last-named, and measures 12 acres. Half a mile to the westward runs another reef, upon which are **The Speakman, The Imperial, The Old Imperial**, and two claims of **O'Driscoll's**.

The township of *Parker's Range* is barely worthy of the name, and consists, I understand, of one public-house and two stores. The last accounts I can lay my hands on state that flour was 16s. per 50 lb. bag, and mutton 7d. to 8d. per lb. Cartage from the railway terminus to this part was £23 per ton, and wages about 10s. per day.

I think I cannot do better than close this *dry* narrative of mining claims than by again drawing on the observant Mr. Halleck for something of an opposite nature. Here are his words:—

“On St. Patrick's Day I gladly accepted an invitation from the warden to accompany him to Parker's, whither he was proceeding for the purpose of having some fencing done at the Cockatoo Rock—the only dam or tank on the track between The

Cross and Parker's. After crossing the Salt Lake at Fraser's South, within a short distance there is another of the same description called Lake Cotton, where we saw a disciple of St. Patrick busily engaged in emptying some bottles under a *mia mia*. This genial, good-natured individual had been sent to The Cross from Parker's for the mails three days previously, but the meeting with old friends and the weather had proved too much for him, and "the poor devils," as he termed the people at Parker's, would "jist have to wait for their letters." Further on we passed two men on foot with their swags in search of work, and then another on horseback in search of the disciple of St. Patrick and the mail-bag. These completed the list of those met with on a road some forty miles in length. The country then traversed was of the usual description, with another edition of the morral tree, with its ever-continuous roots neither revised nor corrected, but were negotiated in a buggy with springs more comfortable than were those in the Boodelin Forest on the coach. At nightfall we reached our camping-place at Cockatoo Rock, a little over thirty miles from the Southern Cross township, and about eight miles from Parker's. This I found to be equal to anything I had seen as a catchment for water. Situated at the foot of a small granite slope, it consists of two square compartments excavated in decomposed granite, the subdividing wall, consisting of the same material, being about 2 feet in width, the upper of which when excavated was for horses,

whilst the lower portion or square tank was intended for those of the two-legged persuasion and for the use of the inhabitants of this district. Both, however, having been abused, it was now deemed advisable to guard the approaches by means of a fence. The bronze-winged pigeons gathered hereabouts next morning would have provided excellent sport to any one carrying a gun. Nearing the gold claims it was noted that there is very little of what could properly be called a range. Beyond one or two bluffs between the field and Cockatoo Rock the country can barely be termed undulating."

### ANSTEY'S REEF.

THIS claim lies some twelve miles to the north of Golden Valley. Here there is a series of small veins of variable thickness, which pinch out, so that one vein cannot be traced far in any direction at the surface. Underground, as seen in the shaft, the vein dips first east, getting very small, then turning suddenly west it makes a large body of stone, without any defined walls, and more a quartzite in character than a true quartz. At the surface it is of a reddish colour from the decomposition of the iron pyrites.

The rocks between these veins are kaolinised mica slates, which in some parts develop into pure kaolin.

It is stated that some gold specimens were taken from the surface where the shaft now is, and all along the cap for a distance of about 20 feet south; but as no gold has been obtained since the shaft has been sunk, the claim has been abandoned. I mention this mine, however, because it was the pioneer of the Yilgarn goldfields.

## COOLGARDIE GOLDFIELD.

THIS field is, I believe, within the proclaimed boundary of Yilgarn; but as it is 120 miles to the south-east of Southern Cross, it may almost be treated as a separate goldfield.

In October 1892 Mr. Bayley made here one of the richest discoveries in the history of gold mining. Soon afterwards he sold his claim to a Melbourne syndicate for £10,000, and in the six succeeding months Mr. Sylvester Browne and his colleagues—the purchasers—took 9000 ounces out of the mine, worth about £35,000. This enormous weight was produced *without the aid of machinery*, and from a hole 45 feet long, 8 feet deep, and 4 feet wide.

The amount of alluvial gold taken from this neighbourhood will never be known, but as from 800 to 1000 men have been constantly at work here since October, and few leave the field without returning, the gold total must be very large. It has been stated at from 30,000 to 40,000 ounces.

Some months before Bayley's great find, a rich patch of alluvial had been discovered, which since then has been turned over two or three times.

**Bayley's Reward Claim**, according to the

Government geologist, shows a reef which consists of a small blow running in a north-westerly direction, and underlying to the north-eastward, striking across the line of country, which here runs nearly north and south. This reef is about 9 feet in width at its widest, but pinches towards either end of the claim, where it is entirely lost. At the north end, there is another blow of quartz, which strikes north and south, following the line of the strike of the country. This blow then dips under the alluvial flat, but a reef on exactly the same line is met with in a shaft in the gully, after which it appears to be lost. The following is a verbatim quotation from the *Western Mail*. I mention the name of the newspaper, and use their exact words, because I confess it somewhat staggered me to read of such a veritable El Dorado :—

“PERTH, June 9.

“From the goldfields the reports received continue to be uniformly satisfactory. At Bayley’s Reward claim at Coolgardie stone is still being raised, averaging from 1 oz. to 6 oz. to the lb.

“It is the intention of the managing director, Mr. Sylvester Browne, to have a main shaft sunk to cut the reef at about 300 feet, and to put a drain into the reef at the first and second hundred feet. In addition to the rich stone now being taken from the reef, another magnificent discovery has been made in a claim 150 feet further north. Lumps of stone have been taken from this part,

weighing as much as 40 lbs., and averaging 1 lb. weight of gold to 1 lb. weight of stone. It is stated that from this spot, 600 ounces were taken within a few hours!"

The available land for prospecting in the immediate neighbourhood of Coolgardie is somewhat limited, as the auriferous belt lies between the granite country and the freehold land of the Hampton Plains Company; but within the next few months there will probably be discoveries to the north-east and south-eastward, as hundreds of men are out prospecting.

Last month (June 1893) the bars of gold and gold specimens from *Bayley's* were brought to Perth, and placed on exhibition at the Union Bank during banking hours. The show was witnessed by many visitors, who were astonished at the richness of the specimens. Some of the stone is described as so permeating the stone, that it appears held together by the yellow metal. It was afterwards taken to Melbourne to be minted.

The Hampton Lands and Railway Syndicate own a very large tract of freehold territory in this locality—their property extending to within  $1\frac{1}{4}$  miles of **Bayley's Find**. Their manager, in making a casual survey, reported over 500 outcrops of gold on their section. This same corporation, in addition to the freehold property, possess in leasehold an area of 1,156,600 acres, which they acquired for pastoral purposes. Their expectation is that the

Yilgarn Railway will be extended to Coolgardie, where a mining population will gather round their freehold. Here the mines can be worked independent of all regulations which are enforced on Government lands, always excepting the royalty to the Government of two shillings per ounce on gold, and  $2\frac{1}{2}$  per cent. on silver.

A town site, with an area of 60 acres, has been laid out on this estate, close to Coolgardie, which, it is believed, will be a centre for the mining population.

The Coolgardie district, in common with many others in the interior of Australia, suffers from lack of water. It is earnestly to be hoped that science will yet overcome this formidable obstacle, and it would appear that the Government are making strenuous efforts in this direction.

Last month (June 1893) the Crown Commissioner of Lands, who had given orders for boring a well at Coolgardie, received the following report from the officer in charge of the operation:—"The bore is bottomed on hard granite at a depth of  $164\frac{1}{2}$  feet, and the supply of water there has greatly increased. I baled it for four hours at the rate of fifty gallons per hour, and made no visible decrease in the supply. At present the depth of water is 38 feet, and I think that it is a good supply. The road from Wangangie to Coolgardie has been cleared, and is a good deal shorter and better than the old one. There is a good catchment for a tank half way between Bullabuling Rock and Wagangie; it is a cane swamp, and at the present time there



must be one million gallons stored. Heavy rains have fallen at the field, filling the tank excavated by the Government to a depth of 4 feet, and in that being excavated by contractor Colreavy, to a depth of  $6\frac{1}{2}$  feet."

We shall, ere long, be in possession of further information regarding this exceptionally promising district, for I see that the Commissioner of Crown Lands has directed the issue of instructions to Mr. R. Brazier, who has been intrusted with the charge of a surveying party between Southern Cross and Esperance Bay. The text runs thus—"The survey party which is to be sent to survey the country between Southern Cross and Esperance Bay, having been placed under your command, you will be good enough, as soon as your equipment can be prepared, to start your parties to Southern Cross. As I think you will find it impracticable to start triangulation eastward from Mr. King's last work, you had better commence at the end of Mr. N. M. Brazier's traverse of last year, and carry it south-easterly, but if you find in your progress the triangulation becomes impossible, you will adopt that system as far as possible. Mr. Newman has been appointed to take charge of the second party, and will work under your general instructions. His duty will be principally to go into the natural features, springs, &c., on your main survey, but the general conduct of your work I must leave to your judgment to arrange to the best advantage. . . . Attention should be given to the collection of speci-

mens of natural history, and any information indeed that may be of anthropological value. Copies should be taken of any native paintings and carvings, and their position noted. Your report should contain a description of the country passed through, geological formation, &c. On your arrival at Esperance Bay, if you can obtain a boat—I am sure Messrs. Dempster's manager will render you all assistance possible—you will make a survey of the islands in the Bay, and take soundings along the channel used in effecting a landing, the rise and fall of the tide, the height of the tide at full, and change of the moon to be noted, and all soundings reduced to low water at the springs. On your journey to Southern Cross keep a diary, and note, from the time of your leaving York, the road traversed, the state of the stopping-places, and the state of the water supply. On your reaching Coolgardie this can be made up and sent to this office. Mr. Goczel accompanies the party as geologist."

**New Gold Discovery** *thirty miles from Coolgardie.*—Just as I am about to hand the MS. of these pages to the printer, I hear of an important discovery of gold, thirty miles from Coolgardie, in an east-north-east direction. I give the account as furnished by a correspondent of the *Western Mail* of July 8th.

"Coolgardie is almost deserted by the alluvial diggers through a new find being discovered about thirty miles distant north-east. The discovery was made through about 150 men going in that direction,

looking for a prospector who was supposed to be on gold near Mount Yuille. The party were compelled to camp for two days where the present find is situated, as no water could be found ahead; but, rain falling, enabled them to continue their search, which they may be doing yet. During the time they were camped, numbers of them walked over the ground where the gold is now being got, and the prospectors saw footprints on what is now the reward claim, and where they have picked up a number of ounces. I also saw holes sunk in various places. Perhaps no better illustration could be given of what the prospecting done in this country is worth when a crowd of men walk over what is presumably a payable goldfield. Two of their number, Hannon and Flanigan, had more luck, as they picked up two pieces of gold near the camp, and retreated for want of water. When they returned after the rain they found that the men and teams had gone on, so they started specking, with the result that they got nearly 100 ounces in a few days, including 9 ounces in one spot on the Reward Claim. Through the prospectors applying for a reward claim, a rush immediately set in. Upon my arrival I found the country where the gold is to be a chain of hills running from north-west to south-east, and from the top of one of them I saw they continued about seven miles to a lake, then apparently turning south for about three miles, where they ended. At the place where the find is situated, the country is equally as good looking

as that at Coolgardie. During the next day the few men who were there did fairly well specking, the majority picking up from a half to five ounces each. Some difficulty will be experienced in extracting the gold from the earth through it being so wet. An attempt is made to do so by spreading the earth in a thin layer, and lighting a fire on it so as to dry it sufficiently to dry-blow. As far as I can judge, a considerable portion of the country to be worked will be very shallow, and if it was in a condition to dry-blow, I think a good portion would be found payable. In one gully a hole was put down and not bottomed at 9 feet, though a good colour of gold was got at that depth. The country will, I think, never be a reefing-field of any extent, as I have not seen any in the locality except those which run along the hills where the gold is, and though small, they must be enormously rich, as specimens have been found as rich almost as those from Bayley's reef. Altogether, I think favourably of the place, as up to the present, gold has been picked up for a mile and a half along the hills, and perhaps by further prospecting it may be found for some distance along their continuation, but it must be remembered by those who would wish to go there, that in a few days there will probably be over 600 men on the find, and I would be very sorry to see any person come from a distance here on my statements, as the estimate of the payable qualities of the place can only be one of supposition, as there is no work done, and I can

only be guided by appearances. But I hope that the find will be good enough to repay the hundreds of men I saw doing forced marches to it from Coolgardie, with loads on their backs that in many instances would be considered enough for a moderate sized horse. When I left, the water was all done, but I hear from one who came in through the night that a good supply has been got eight miles away. I was away from Coolgardie twelve days on a prospecting tour, thus happening to drop in at the first of the rush. On my return to the town I had to ask what the new buildings were intended for—showing that the place is going ahead—and though all eyes are on the new find, I still adhere to my former opinion that Coolgardie has a great future as a reefing-field.

“Warden Finnerty held a court here about a fortnight back, and got through a considerable amount of cases in a short time, the majority being connected with mining. His decisions, though probably objectionable to the losing side, were endorsed by the general public. He has now gone to Dundas Hills, and having been there myself, I do not envy him his journey.

“During the last fortnight we have had good rain, and I am afraid if it continues, the roads will get so bad that the carriers cannot travel them. If so, we will get some idea of what a famine is.”

## THE MURCHISON GOLD- FIELDS.

THESE fields are situated about 320 miles to the eastward of Geraldton, or about eight days' journey. The road for the first sixty miles is rather bad, the first thirty miles being chiefly sandy hills, where water is scarce, and the second thirty miles crosses a sandy desert quite destitute of water. The remaining distance, however, leads through the bush and presents no great difficulty, water being obtainable at easy stages.

The territory begins to show auriferous signs within eighty miles of the diggings, and several belts are passed over which are well worth prospecting. The fields as you approach are full of such indications as gladden the eyes of a practical miner. Quartz and ironstone in fragments strew the entire surface, and outcrops of the same are visible in all directions.

The proclaimed area of the goldfields is 32,000 square miles, the principal auriferous belt being situated at the eastern side of the district, and runs in a north and south direction, from West Mount Magnet to Austin's Lake, and then in a north-

easterly direction to Lake Anneen and Yagahong. Other rich patches exist further east, and a few patches have also been discovered nearer the coast.

These fields were the result of a discovery by Macpherson and Peterkin, near Lake Annean, which is now being worked as the Nannine Mine. It may be mentioned that at Mulga Mulga and Yuin in this district gold had previously been found, but not in paying quantity; hence the search was abandoned for the time.

The geographical features are described by the Government geologist as "the ruined remains of a vast high sandy table-land, presenting to-day a broken surface, consisting of salt marshes or lakes fringed by salt, sand, clay, gypsum flats, from which rise low rough hills of metamorphic rocks or white cliffs, on the top of which are sandy plains, the remains of the ancient table-land. There are no well-defined rivers, but the few creeks discharge themselves into the salt flats, where the water evaporates, except after excessively heavy rains, when they overflow into the rivers which run towards the coast. The hills are mostly small and low, consisting of ridges of hard metamorphic rocks, near which the rich finds of gold have been made. These are often capped by the same horizontally bedded formation exposed in the cliffs at the edges of the broken table-lands, which are generally covered with dense thickets of low scrub.

Nature's most formidable obstacle in the path of the gold-seeker throughout the colony is want of

water ; but the Murchison district is fairly well provided. Near the salt lakes there is a scarcity, but even there, if the well be sunk a short distance away, the water is found to be fresh.

In most of the mines good water has been struck considerably under 100 feet down, and in fact it does not appear that the water question is likely to hinder the development of these fields. The lack of timber is more to be dreaded as an opposing factor, particularly at the south end of the field, where there is nothing but mulgar.

The Murchison fields contain within their area many subordinate claims, and these again are further subdivided. I shall enumerate a few of the most prominent workings.

**Mount Magnet.**—The Mount Magnet diggings are situated a few miles to the south-west of West Mount Magnet, a hill chiefly composed of metamorphic rocks capped by a flat top of desert sandstone. The rocks strike mostly a little west of north, dipping to the westward, and consist of decomposed slate, dolomite, talcose schist, and ferruginous jaspery quartzite. The reefs follow the same strike, also dipping to the westward. They are small, but well defined, in some places carrying gold well through the stone. The quartz is mostly white and rather greasy, with ferruginous stains and yellow clay partings ; but nothing very rich has been found in the reefing line on this part of the field except the **Monarch Mullocky Leader**, which is not a true reef, but a mass of decomposed talcose schist, through



which there are a number of small ferruginous quartz veins. The whole mass carries fine gold, the soft part having already proved very rich. On the surface a small but very rich patch of alluvium was worked along the side of a large ferruginous quartzite bar.

All the alluvial work here has been surfacing, the patches being worked by dry-blowing places, where a mixture of quartz and ironstone are found scattered over the surface.

The auriferous nature of this section is probably connected with a large ferruginous dyke, which lies close to the westward of the workings, and which does not follow the exact strike of the country. A large quantity of gold has been obtained here from simply puddling and washing the decomposed rock, whilst the stone has been reserved for crushing.

**The New Chum Reef** near here is small but well defined, and has been opened by several small shafts. It is about 3 feet in width, striking north and south, and dipping at an angle of 75 degrees to the west. The stone is of a white glassy nature, with yellow ferruginous bands, which generally show gold, and the metal is often visible in the solid stone.

**The Mount Magnet Reef** is of small dimensions, varying from 2 or 3 inches to a foot; there are bunches of stone in places, however, where the reef widens to 2½ feet.

Mr. R. R. Cruikshank, a mining expert of forty years' experience, in speaking of a visit to Mount Magnet soon after gold had been found, states that

thirty-seven men collected 400 ounces of gold in four days merely by keeping their eyes open and picking up the alluvial. It so happened that the Government Scab Inspector chanced to be in that district on his rounds and picked up a two-ounce nugget. This fired his ambition, and when his horse dislodged a four-ounce nugget, he resolved to hand his resignation to the authorities. Scabby sheep stood a poor chance against virgin gold.

One who journeyed to this part soon after the rush has written a description of what met his eye. It is rather lengthy to reproduce *in toto*, so an abridgment will be more acceptable. He tells us that at the Minginoo Station, just where the Midland Railway makes its great bend to the south, and where two years before he had camped in a dense solitude, a township had sprung up suddenly. Two stores, a boarding-house, and the railway station are the nucleus of what he conceives may yet be an important city. Underneath the shady trees around the spring teamsters, diggers, bushmen, and others are camped. From here the gold seekers set out on their weary journey to Mount Magnet. Here may be seen men in all stages of the gold fever. Some gaily starting off along the Gullewa Road with plump horses and new outfits, and others on the return journey, cured of the fever, footsore, and weary, but very probably with a comfortable bag of gold dust concealed about their persons. One, to the narrator's knowledge, had £300 worth; but the amount is usually kept a profound secret. The season has been

a dry one, and over 6° of longitude, stretching from the Buttera Range (117° W.) to the desert sandstone and spinifex (123° W.), hardly any rain had fallen for three long years. Rain is sadly wanted, and the digger thinks of the glorious Greenough flood of 1888. Another such fall of rain, and he prophesies that Western Australia will be the envy of the world. Mining experts from all parts, it seems, have been prospecting in all directions, and gold has to take a back seat according to these learned men. They talk familiarly of *vanadium*—a true monarch among metals—thirty times as valuable as gold. Then they hint at the presence, in large quantities, of *stibidium*, *palladium*, and *iridium*, heaviest and hardest of metals. But remarks our friend, "I have noticed that it is not generally the educated man who is the lucky one; but rather he who has the hide of a pachyderm and the stomach of a camel."

By way of illustration we are told of an elderly man who came in the rear of the great rush to Mount Magnet; he was certainly not a mining expert, but more like a station hand or shepherd. His capital consisted of one solitary half-crown, but he bargained for rations with a neighbouring station-holder, on the condition that if no gold turned up he was to go shepherding. His style of "digging" was quite original. He would grope about on his hands and knees in the gullies, picking up the barest livelihood. Somebody got tired of dry-blowing, however, preferring a sure eighteenpence a head per week, for looking after digger's horses.

He made over his supposed worthless claim to the old shepherd, who almost immediately struck a "mullocky leader," graphically described as a "veritable jeweller's shop." Here he made his pile and retired permanently from the shepherding business.

The narrator then gives an account of Mount Magnet itself with its white tents, hawkers, store-keepers, and camp followers. He tells us of the great quantities of sandal wood within 60 miles of Minginoo Station. In the great thickets to the eastward, it seems, many bushmen perish every year from thirst. "Even the best bushmen," he observes, "require to be very careful in the hot months, as the thirst causes not only physical weakness but a confusion of ideas, against which the strongest fight in vain, and to get lost is to perish."

Finally we hear of a futile attempt made, in the beginning of 1892, to cross overland from Yilgarn to Mount Magnet. The man who undertook the journey had two horses, and before he got half way he was reduced to such an extremity by thirst that he had to kill the pack horse to drink the blood. He then struck a track which leads from Berkshire Valley to Mount Kenneth; but instead of turning to the right, where he would have reached a well in three miles, he took the left road, and so had a waterless stretch of sixty miles before him. Aid reached him by the merest chance, or he must have miserably perished.

Referring to the vastly precious metals which throw gold quite into the shade mentioned by our Mount Magnet friend, a curious paragraph caught my eye in a spiritualistic journal called *The Harbinger of Light*. Reader, I do not believe in spiritualism; it is beyond me. Charles Dickens' faith was shaken, was it not, when he called up the ghost of a great grammarian? "Are you the spirit of Lindley Murray?" asked the novelist. "I are," replied the voice; "grammar should survive the grave," thought Dickens, "and became a disbeliever."

However, take it for what it is worth, here is a statement supposed to emanate from the disembodied spook of the late Professor Denton:—

"That which is known concerning the mineral deposits of Australia is as nothing compared with that which is unknown. The bounty of the Infinite Father is inexhaustible, just as His creative power is unlimited. Beneath the earth you tread upon lie treasures undreamed of by those who have hitherto been scraping its surface, or who have somewhat rashly presumed to speculate upon what is as yet invisible to human eyes, from a knowledge of that which has been already laid bare. In certain regions of this immense continent, the miner will yet come upon deposits of mineral wealth which will astonish him no less by their magnitude than by their novelty. For the list of metals belonging to your earth is still very incomplete. Gold and platinum are by no means the most precious of those which are to be

found stored up in what may be called the cellars of the globe. There is no finality with God, either in Nature or in that inspiration from the Divine Mind which you call Art. And gold may yet be superseded by a metal which will possess all the qualities which have made it so precious, so admirably adapted for a symbol of value and as a medium of exchange, and so useful in many of the ornamental arts of life. And I may take upon myself to say that such a new and precious metal will be found in Australia, and that the region to which the search for it should be directed will be the western portion of this continent, where it will be discovered in sufficient quantities to divert thither most of the stream of emigration which now flows across the Atlantic, and also to communicate a fresh and lasting impulse to the progress and development of the colonies. It may even change the economic history of the world by introducing a new factor in its progress, a new element in its commercial intercourse, and a new source of prosperity to the inhabitants of Australia more particularly."

For a considerable time after the Mount Magnet rush, there was only one woman in the camp. Her name was Mrs. Cartwright, and she did a fine trade in selling liquor and letting lodgings. Christmas was signalised by the usual festivities, and "our only lady" seemed in the best of spirits. Two days before the New Year, however, she was found dead in her tent with an empty bottle of laudanum on the table. She had evidently taken her life in

a fit of temporary insanity. By this rash and inconsiderate act the diggers were bereft of all female society.

### LAKE AUSTIN.

SOME thirty miles separate this lake from Mount Magnet, and the intervening district does not present an auriferous appearance. Most of the rocks are intrusive granite, often overlaid by desert sandstone; still there are a few patches of promising country.

**The Island** is a high ridge of metamorphic rock, the main axis of which is a bed of ironstone. It runs in a nearly north and south direction for a distance of about two miles, being divided from the north and south shores by two narrow arms of the lake, each about half-a-mile wide, which are quite impassable after heavy rains. Caution is therefore requisite; for as there are no springs on the Island, it would be an awkward place to be weatherbound in.

Some of the richest finds have been made here, and it is the only place where anything like deep ground was met with, a well-defined gutter being found on the bed-rock at 15 feet from the surface. Rich alluvial ground was found near the centre of the Island, but no paying reefs immediately on its course. The sinking was tough work, as the alluvium was cemented together by gypsum.

The reefs are very rich, but do not carry gold to a great distance along the outcrop.

Some productive patches exist on the mainland to the north side of the lake, and the country to the eastward has a very promising appearance.

To illustrate the wealth of gold in the aforesaid deep ground or gutter, two Queenslanders—Keily and his mate—took a specimen from the wash weighing 28 lbs. From this was dollied no less than 59 oz., 13 dwt. of the precious metal.

Of course there are bitter complaints, some reasonable enough, and some the usual products of the everlasting and ubiquitous grumbler. One man writes to the *Geraldton Telegraph* as follows, referring to the island:—

“No matter how deep, the surface is too poor to work, not one out of every ten could average 2 dwts. per day, and the balance are not able to earn 3 dwts. per week on the too deep leads. On the Island work is also suspended for want of tools; the cement is so hard it requires powder or dynamite to sink a shaft. There are neither picks, steel gads, nor hammers to be had at any price. The few parties who managed to bottom at a depth of 25 feet cannot drive for want of candles to show them light underneath the surface. The ‘donkey-power’ store-keepers on the fields, and their lords and masters at Geraldton, lack the energy of the colonies, and retard the development of the goldfields. They will not send supplies up unless they receive cent. per cent. and a half profit for them. Most of the so-called stores here are mere grovelling grog shanties, yet the said keepers cry out against the introduction of



the camel, which will prove a providential boon to miners and fossickers in general, and enable them to live on shortly at the rate of 20s. to 25s. per week, where formerly it took £3 to £3, 10s. to eke out a subsistence, and a poor one at that. We wonder why West Australian storekeepers do not howl against the introduction of the 'iron horse,' as it also means cheap carriage. Imagine, and let others say what they will, at the present time you cannot obtain either butter, cream of tartar, soda, or jam for your own consumption. Good flour and salt are always scarce. Tools required for deep-sinking, horse-shoes, nails, and hobbles are looked upon as being quite unnecessary by those wretched vendors of bad grog. The want of water was severely felt by those on the island until the late rains, the men paying a shilling a gallon for it, whereas if our noble Premier's Government would only come to the rescue, permanent water could be had in the granite a few miles off the island."

**The Chicago** is a small but immensely rich cross reef, striking east and west and dipping gradually north. It is crossed by a large main north and south reef, and at this point there was a specially rich deposit.

Some of the stone from this mine actually carried more gold than quartz; but this class rarely pays in depth, and as no gold-bearing stone has been found on the outcrop it may be put down as a local patch.

**Lawrence's Claim.**—This is a similar kind of

area to the last named, rich and concentrated but not continuous.

These last two diggings are the working miner's paradise, for a fortune can be made by dollying the stone. For a company to erect machinery it would be imprudent, unless the gold was proved to go down at least 50 feet and to extend along the reef.

### THE CUE.

TEN miles north from Austin's Lake, passing over a country covered by salt, sandy flats, or clay covered with thickets, we come to Cue's Reef, which gives its name to a considerable district. The discovery was made on Mr. Townsend's station by Mr. T. J. Cue, who picked up ten ounces of alluvial close to the reef. The field is about 150 miles square, the road bad, and water rather scarce. This, with lack of vegetables, caused much sickness and hardship in the early days of the rush.

**Eight Mile Patch and Four Mile Patch** show promising and well defined reefs of metamorphic rock and ironstone. They derive their names from their distances from **The Cue**.

The line of auriferous country runs in a north-easterly direction to an abrupt line of reef forming the main ridge, and is known as the

**Day Dawn**.—The stone is of a bluish mottled appearance, and the reef of great size. On its slopes

much alluvial has been found. The lode runs north-east and south-west and dips west. After trenching to the lode an underlie shaft was commenced, 6 feet by  $3\frac{1}{2}$ , to a depth of 80 feet. At the bottom the reef measures 9 feet in thickness, and on the face of the dark blue quartz could be discerned fine gold.

**The Day Dawn South** is on the same line, but the reef runs west-north-west and east-south-east. The stone is of a similar character to the last-named, and contains a little galena.

**The Day Dawn No. 1** is on the same line, the reef turning to the northward, about 6 feet in width, with a good show of gold.

**The Union Jack** is an offshoot or split of the Day Dawn, and of similar character.

In the Cue district are situated what were known as the "specking grounds." Here for many weeks hundreds of men examined every inch of the surface, turning over every stone with a forked stick, in case it should contain gold, or cover a nugget. The surface of these patches is covered with quartz and ironstone, much of the former carrying gold. In some parts, after being specked, dry-blowing proved remunerative.

**The Lady Kintore** is a large reef which forms one of the main hill-ridges, rising in two or three steep blows to a height of 50 or 60 feet above the surrounding level. The stone is white, often iron-stained, with brown bands frequently showing gold.

**O'Neill's and Jackson's** are  $1\frac{1}{2}$  miles north-east

of the Cue. They are composed of blue quartz, and are of small size, but show gold freely.

**Pead and Edward's, The Phoenix, Prendergast's, and The Harp of Erin** are on a belt of white decomposed granite country. The white quartz gives a good show of gold, and dollying has been remunerative, considerable quantities having been stacked for crushing.

Mr. J. M. Aldridge, a miner of large experience, who visited these parts last August, strongly advocates the erection of a public crusher in the Cue district, which he feels sure would be supported by all the miners. He speaks very highly of the Day Dawn reef, and mentions that on the **Port Darwin** claim at the **Eight Mile**, stone had averaged 20 ounces a week for three men dollying.

Pead and Edwards were at this time down some 42 feet, and dollying enough to pay working expenses on their claim. Mr. Aldridge concludes thus:—"What ruins the prospects of many fields is the fact that many men give the reefs such a superficial trial. They go down a few feet, and then, perhaps, because it does not pay to dolly, they throw up the claim as a duffer."

Here are a few practical remarks from the same source, in answer to the question, "What do you think of the prospects of this part of the Murchison goldfields?"

"Well, any man who is a practical miner may do some good there. But, as far as Lake Austin and The Cue are concerned, it is no good for

amateurs to rush up there expecting to make a living out of alluvial. The alluvial workings are played out. Amateur miners are of no use up there, as there are already hundreds of men who are unable to make a living. The colony will never flourish by alluvial workings, as, you see, no sooner does a man discover a rich alluvial patch than he clears out of the colony with the proceeds. With the reefs, however, it is different, and I think that, in time, this field will carry a large population of miners, and when the machinery goes up there, there will be employment for a great number of people. The alluvial, as I said before, is played out."

### THE DEAD FINISH, OR CUDDING- WARRA.

EARLY in 1892 a discovery was made ten miles south of the Millee Spring, and the same distance due east of the Cue—near Cuddingwarra. J. W. Perryman found a nugget weighing 100 ounces, and various diggings were started, although I do not think he was the first discoverer.

**The Mills and Townsend** is a small reef running north-west and south-east, and uniting with a large ferruginous reef at the north end of the area. A rich alluvial patch was likewise found.

**Perryman's** reef is on the same line further south.

**The German Line** consists of several rich patches which have been dollied with considerable success.

Regarding this goldfield, it may be said, in conclusion, that it runs parallel with the Cue. The same kind of reefs are found, and in places are very rich.

### THE MULGA MULGA OR BIEREN.

A FEW miles northward of Cuddingwarra gold was here discovered by one Birk in 1888, but was not followed up. The reef is small and ill-defined, but shows fine gold in places on the surface, associated with copper pyrites, iron pyrites, and antimony.

### THE NANGRANG HILLS.

EARLY in 1890 gold was discovered five miles east of Yuin station.

The reef is large, strikes east and west, dipping to the north. It is a blue quartz with copper stains, and the rocks follow the same strike. This place, from its plentiful supply of water and proximity to the coast, has manifest advantages, and even a poorer grade of stone could be made remunerative.

### LAKE ANNEAN.

Fifty miles north of the Cue lies Lake Annean, which extends some seven miles north and south, and consists of a succession of sandy ridges and marshes, which are impassable after rain. The main line of the reef runs north from the lake up the spur of rough ironstone ridge. It stands up in huge blows in which gold rarely occurs, and to one unused to Australian mining presents an unpromising appearance. Patches have been found, however, of great richness, and large quantities of gold taken from holes a few feet deep.

The main line of reef is well defined for some distance, but at the north end on the Mount Hall area it pinches out and is lost on the surface. To the southward, on the Connelly-Murchison area, this reef begins to split and change in character, losing its defined appearance. It is mostly white at the surface, but is of a bluish colour throughout, containing a little galena and pyrites at depth. It is a main fissure vein, and the rich shoots probably go down to a considerable depth.

Rich alluvial patches were found on an island to the southward, and rich surfacing was done on both sides of the main ridge.

On this field there is plenty of fresh water and timber within reasonable distance, though the former

is apt to become brackish if heavily called upon in the dry months.

Many leases have been granted in this district, a few of which may be mentioned.

**Mount Hall**, upon which two shafts have been sunk and much money spent, is a protection area, which, if judiciously managed, may yet prove remunerative.

**The Nannine** is next to the southward. The Nannine Gold Mining Company have erected considerable plant, and have raised a large quantity of good paying stone. They have the great advantage of an excellent well, which aids the development of the property.

The manager of this company, Mr. W. E. Clifton, was testing samples of stone from this mine. Six specimens yielded a similar result, which made him suspect something was wrong with his apparatus. He says, "I got the blacksmith to take the bottom out of the mortar and pass it through the fire, when I found that most of the gold was got from the old pestle and mortar used by M'Pherson."

**The Royalist** is a small rich area on the south of the last named. A rich shoot of stone has been struck, which is permanent reef, and should pay well.

**The Connelly-Murchison** and **Robinson-Murchison** are a continuation of the Nannine reef, and should prove productive.

**The Home Rule Murchison South** and **Star of the South** are next on the line where the lode splits



up into several reefs with a continuous line of blows. Nothing very sensational has been found here, so far as I can ascertain.

**The Caledonian** gives its name to an important line of reefs, owing to rich stone having been found on this claim at the junction of two reefs.

**Du Boulay's** is on what is thought to be the northern extension of the last named line. Here surface prospects were good, but the stone pinched so in depth as to make working doubtful.

**Watt's** is further south on the same line, and similar in most respects.

**The Caledonian Extended** is being worked to open up the Caledonian reef, which has been traced into this area and lost.

**Pearl's, Ramsey's, and Barrett's** are next south, and reefs have been struck which follow the Caledonian line. Barrett's was reported to be very promising, there being a free show of gold in a settled character of reef.

**The Queen of the Lake** is about  $1\frac{1}{4}$  miles north-east of the Nannine, running north-east and south-west. It varies from two to six feet in width, and exhibits free traces of gold in the stone.

Other mines in this district are the **Hidden Treasure**, the **Star of the East** (with a claim 700 yards long and a well-defined lode 2 feet 6 inches in width), **Merry England, Lake Extended**, and others, of which space forbids further mention.

### GARDNER'S.

SOME twenty miles eastward of Lake Annean is a hill named the Yagahong, and in this neighbourhood gold was accidentally discovered by a party who lost their way in a dense thicket. The reef does not appear on the surface, nor are any rocks visible. The surface is covered with a white deposit of gypsum and sand or magnesia, sometimes called "opaline" on the Murchison. It is formed by the action of water, which is generally, but not always, found in close proximity. This locality, however, has proved an exception to the rule.

**The Star of the East.**—This claim is owned by Gardner & Co. Its geological formation is similar to that of the Annean field, namely, slate and schistose rocks, which are largely intersected by dykes of a highly ferruginous flaggy quartzite. The lode runs from 2 feet to 2 feet 6 inches in width, with well-defined walls. The reef strikes east and west, and has been traced on the surface carrying gold. The water level is here about 60 feet from the surface, and the formation improves as it goes down. This claim comprises 700 yards along the line of reef. There is a creek near at hand, from which water can be obtained at a moderate depth, while fuel and timber are obtainable. The stone here differs in character from any other on the Murchison, and though not showy is extremely rich,

carrying fine gold all through. Gold has been found along the outcrop of the lode from end to end, and altogether this mine is a very valuable property.

To the westward, adjoining this claim, is the **John Bull**, measuring some six acres, and to the eastward the **Grand Old Man**, covering twelve acres. The leaseholders of both these properties have been the aggrieved parties in two "jumping" cases, from which they emerged victorious by decision of the Warden. I need scarcely explain that to "jump" a claim signifies to take possession of it without legal right or permission, something like the method adopted by the cuckoo towards another bird's nest.

Two miles to the eastward of the **Grand Old Man** are **The Findon, Menzies, Maryland** and **Imperial** claims. These adjoin one another, measuring twelve acres each. The reef runs east and west, and there is a considerable show of gold.

### TOPPING'S.

ABOUT thirty-five miles east-south-east of Nannine is the above-named claim, which gives its name to a new field. Prospects appear bright, and on the same line of reef several leases have been granted.

On the north end, and immediately adjoining Topping's, is the **Beaconsfield**.

On the southern end is the **Gladstone**, and

adjoining the latter are the **Sir Garnet** and the **Premier**.

These have an area of twelve acres each, and this is, I think, the only field where a uniform twelve-acre limit has been adhered to.

### QUIN'S.

I OBSERVE that the Government geologist describes the two last-named claims—the **Sir Garnet** and the **Premier**—as being on the above-named field, whereas Mr. J. C. Sherrington, in his excellent map of the Murchison goldfields, places them on Topping's.

The former authority states that “the **Sir Garnet** is a large lode, mostly composed of hematite, in which there are bunches of quartz which show gold freely. The hematite is the result of the decomposition of sulphides, which will be met with in depth. Considering the richness of the stone, length of out-crop, and size of lode, this mine should pay.”

“**The Premier** is also a large ironstone lode, but seems to carry the gold only in small veins, on the extent of which will depend the value of the mine.”

Last year, at the small township of Nannine in this district, a tobacco famine afflicted the camp. In fact, they ran short of other commodities, but the want of tobacco was the sorest trial. I quote

a correspondent of the *Victorian Express*. After describing mines and prospects in the neighbourhood of Nannine, he goes on to say—

“For many weeks the following lines were not to be had for love, money, or profanity—candles, matches, milk, bacon, cheese, tobacco, &c. The deprivation of tobacco was felt severely by smokers, and most diggers are of the smoking persuasion. And the shifts made use of by some of them to supply the lack of the king of herbs were curious, if not amusing. One might be seen puffing away serenely from a bowl loaded to the muzzle with coffee. Another affects Amgoorie tea, a third calmly sucks away at a mixture of compressed vegetables and bottled thyme; while one, more venturesome or less squeamish than the rest, tranquillises his soul with a pipe filled with—well, let us say, the *debris* of a sheep yard. I tried mulga leaves myself, and other strange devices, and am now engaged in consuming, one by one, all the old vest and trousers’ pockets I can forage up around the camp. When a teamster arrives he is ‘rushed’ by every smokist in camp, and compelled to disgorge the smallest ‘gombeen’ of tobacco he has about him. Joe Patience was the last victim, and he didn’t belie his name, for he handed over every bit of nicotine he was possessed of—at the moderate price of 7s. 6d. per pound. But when the supply ceased, and the unsupplied smokers still crowded around him with threatening looks and gestures, he was at last forced to take refuge in flight, and, it is

currently reported, was last seen peeping out of an empty ale cask, at the back of Dan Downey's."

The same writer tells how urgently the need is felt of a medical man for this large district. The cold season had just set in, and the demand for blankets is very brisk. "If the teams do not soon arrive with a supply of 'nap'" (which appears to be the Nannine vernacular for blankets), he concludes, "we are all likely to be frozen as well as starved." His next paragraph is much more cheerful, and shows that things were not quite so bad as they might be. It is pleasant to read of such house-warming festivities in these remote Australian deserts. Here is his account of the affair:—

"Mr. W. Ramsay opened his new 'Murchison Hotel' on May 21st, celebrating the occasion by giving a 'free house' for that evening. Many of his patrons attended and drank his health, and that of his energetic spouse. Solid refreshments were also furnished, and the boys had a real good time. Songs, merry and plaintive, echoed far and wide over the Nannine flat, and choruses soared heavenward, which, if not harmonious, were at least given with a will, including the whole canine population to assist in the upper notes, and started the hawks and crows off in mad flight to the solitude of Bailey's Island."

Considering the cost of carriage, prices were very moderate by last accounts from the Murchison. Flour is quoted at 9d., tea 2s. 6d., tobacco 6d., tinned meats (2 lbs.) 2s. 6d., fish 1s. 6d., and other articles in

proportion. Fresh meat was almost unobtainable, and in the case of mutton very inferior.

Intoxicating liquors are, of course, to be had in great abundance. Indeed, so much attention seems to have been paid to the importation of this line of goods, that on more than one occasion the miners threatened to smash up the next consignment if the storekeepers neglected to bring in the real necessities of life.

Last year five licensed houses were in full swing at Nannine, viz., "The Pioneer," kept by Dan Downie; "The Royal," by Tom Tombs; "The Excelsior," by Messrs. J. & C. J. Prendergast; "The Nannine," belonging to W. C. Petchell, and managed by R. J. Earle of Geraldton; and "The Murchison," just referred to.

A correspondent thus concludes an interesting letter:—

"Drunkenness is almost unknown, crime is a blank, and, but for their mining duties, the police would have a sinecure. I must say that a better conducted set of men than the diggers are here would be hard to find. Not one scene of violence have I witnessed since my arrival, and this on a spot 300 miles from civilisation, amongst two or three hundred men, and but one solitary woman (Mrs. Ramsay, of the Murchison Hotel), who feels as safe here in a wilderness like this, as if she were running the 'Club' in Marine Terrace.

"Mr. Walter, the Warden, has, and deservedly, earned golden opinions from all. His gentlemanly

demeanour, his firm suave manner, and his obviously business-like way of settling affairs, have convinced every one that for once the Government have selected very wisely, and that the right man is in the right place. The Mining Registrar, Sergeant T. Binning, is an able assistant, and a general favourite. This in a mixed community, as is a diggers' camp, is high praise. I knew him when he first joined the force in this colony, and he is every inch a most deserving officer."

I have already alluded to the immense area of Western Australia. I have likewise referred to the water difficulty. Another great obstacle to progress on the goldfields is the enormous cost of freight to the interior. This trouble is aggravated by the greed and jealousy of storekeepers. Eastern camel owners have endeavoured to ameliorate this embarrassing state of things, but have met with bitter opposition. At Geraldton, for instance, the storekeepers actually combined not to load the camels, and Faiz Mahomet, who had risked a considerable sum in the animals, threatened to supply Southern Cross district with stores on his own account. He had the sympathy of the miners, and no wonder. The carters made a charge of 6d. a pound, whereas the camel freight was 4d. a pound, and 2d. a pound for such stores as were needed by miners travelling to the Murchison field.

Let me quote the words of two correspondents. This is what the first man says:—

“ ‘What do the diggers think of the camels?’



“‘I think the camels are the greatest boon the diggers ever had. The relief of Lucknow was nothing compared to our contentment on the arrival of the camel train with provisions for the first time. It was then that provisions came down to something like a reasonable price. The camel carriers got no support from the storekeepers, but all the diggers speak most favourably of the arrangement, and every one hopes they will succeed. Besides, in the summer, the horse teams will be unable to get up to the fields, and the miners will have to rely on the camels for provisions, and, in fact, every one I spoke to on the field was in favour of the camel carriers.’”

And again I read a paragraph of true colonial type. It runs thus:—

#### “CAMELS *v.* TEAMS.

“While we were all glad when the camels came to reduce the price of carting to these fields, we were not prepared for the treatment we have received from Messrs. Duff (some spell it Duffer) & Co. About sixty camels came to Wilson’s patch, and sold almost all out at once a long time ago; but until last Tuesday nothing more was heard of the camels, and I understand they would not then have come but for P.-C. Jones, who spoke of our destitute condition. Most of us were reduced to our last pound of flour, and many were living on beef alone in the hope of some one coming with supplies. Two or three days more would have seen a general stampede

of hungry men prepared for any emergency to obtain 'tucker.' However, twenty-seven camels arrived with a very limited supply of stores, which were doled out by Mr. H. Gale at the rate of from 8 to 10 lb. of flour, 2 lb. of sugar,  $\frac{1}{2}$  lb. tea, 1 lb. raisins, and so on. As for preserved fruits, sauces, pickles, milk, jams, &c., a disgraceful blackguard rush was made for these, and might was right so long as the cases held out. These are the places to observe phases of human character—a nondescript community indeed. If Messrs. Duff & Co.'s ears have not burned of late, heaven send they never may, for there's not an epithet in our language that has not been applied to them for their neglect of us."

So much for human avarice!

## ASHBURTON GOLDFIELD.

ALLUVIAL gold was found on the Ashburton River early in 1890, in a creek flowing down a gorge about 200 feet deep, between steep cliffs of clay-slate capped by almost horizontally bedded limestones.

This river is about 500 miles long, and discharges its waters about 60 miles west of North-West Cape. The discovery was made at a point about 150 miles from the coast.

**Top Camp Diggings.**—The gold here is very pure, and free from quartz and ironstone. The larger pieces are usually of a flat bar shape, owing to their having been formed between the slate ledges by the slow accumulation of fine gold, which in course of time has become a solid mass following the shape of the cavity where it lay. Heavy nuggets have been taken from these diggings, weighing as high as six pounds, but the total amount of gold gathered it would be impossible to estimate, as a very large proportion would never be reported. The run of gold in the main gully of **Top Camp** extends for over a mile in length, and most of the gullies north and south along this line have proved very productive.

**The Soldier's Secret** camp is about 20 miles to the north-west of **Top Camp**, and about 14 miles up the Mount Blair Creek. It is of very similar character, the gullies running between steep clay-slate hills, and carrying gold for distances of from 200 to 400 yards. Gold was found of very fine quality here, and the diggings have an area of about 5 square miles. Messrs. Cook & Green sank a well in the bed of Mount Blair Creek, which, at the time of writing, yielded a good supply of water. To the north-west was found the remains of an old lead, with considerable show of gold on the surface and in pockets.

There is very little quartz, either here or at **Top Camp**, but a good deal of ironstone is found with the gold in washing.

This line of country is crossed by some large quartz reefs, and some very promising reefs of smaller size. Pieces of gold up to an ounce in weight were found on this ground.

**The Dead Finish** is situated on the north side of the river, 6 miles to the north-west of Gregory's Deep Creek. There is more quartz in this district, which is less hilly; and gold has been found in the gullies up to the quartz reefs. This was essentially a poor man's paradise, for a large amount of gold was picked up without the exercise of skill or apparatus. Pieces up to 8 ozs. were thus obtained. Water was extremely scarce by last reports, and at one time had to be carted 6 miles to the camp.

**The Gorge.**—These diggings lie some little distance

to the south-west of the **Dead Finish**, but on the other side of the Ashburton River. A considerable quantity of alluvial gold was found here, some of the nuggets being of good size. The country, however, was neither extensive enough or rich enough for the numbers on the ground when the rush set in. The majority, therefore, were disappointed and moved elsewhere.

**Mount Mortimer Diggings.**—These are situated about 7 miles south-east of Mount Dawson, according to the new maps. The old designation of the hill was Mount Mortimer, hence the title of the camp. Here the country becomes somewhat altered in character from that of the upper fields. The clay slates are often replaced by sandy slates and ferruginous sandstone beds. The gullies are not so steep, but sinking was generally deeper, and the ground being much harder, it took a longer time to work out a claim.

In one gully a quantity of large pieces was found, one nugget weighing 56 ozs., but in the other gullies very small pieces were got, and generally associated with ironstone. The nearest water is 2 miles distant. Here the claims took five or six weeks to work out, so money was not quite so easily made as when slate bars had merely to be raked over with a pick.

Regarding the **Ashburton Goldfield**, an auriferous belt of country extends from Hick's, on the Ashburton, following the river in a south-easterly direction, for about 150 miles. This gives a total area of about 10,000 square miles.

The rocks are similar to those of the auriferous areas in the other colonies, but different from those of the Western Australian goldfields to the south of this district.

This may yet prove one of the richest fields; but prospecting will cost money and necessitate hard work. It is when the deep ground in this district is laid bare that large returns may be expected.

## PILBARRA GOLDFIELD.

THIS field has a proclaimed area of 32,000 square miles. It is situated in the north-west district of the colony.

Its general features are alluvial plain, which follows the coast-line, broken occasionally by rocky hills, and a high tableland to the south and east.

On the northern edge of this plateau several rivers have their sources, and cut deep gorges through the upper horizontally bedded rocks, which expose crystalline rocks across the line of their channels. These gorges run towards the north and north-west, first through limestone and quartzite rocks, then through flats bounded by rough sandstone and by deep ravines through broken hills of schists, slates, sandstones, quartzites, conglomerates, and amygdaloids, into alluvial plains, from which rise occasionally bold hills and small peaks of quartz, granite, and ironstone. These plains stretch to the sea-coast, where they are fringed by mangrove swamps, except where trap-rocks form a rugged coast. The amygdaloids in many places split up into rough blocks, which become red or black on the surface, and then present the appearance of a huge heap of stones,

without soil or vegetation. They contain vast numbers of agates, crystals, and other enclosures, so that the streams permeating them would be worth prospecting for precious stones.

There are many important fields within this great area, which no doubt carries, sleeping within its veins, countless millions in the shape of virgin gold.

These, again, are divided and subdivided as claims are taken up. I will endeavour to enumerate and describe the most prominent of these districts and properties.

**The Nicol.**—A Chinaman of exceptional simplicity of character is said to have discovered these diggings, for he divulged his discovery to a countryman of equally childlike character. The latter, it appears, was cook to a doctor, and informed his master, showing him a nugget of 33 ounces in weight. The doctor recognised the metal, and forthwith applied for Government authority to work the claim. He did not make much of his speculation, as far as I know.

The diggings are situated some twelve miles west of Roebourne, and a fair quantity of gold seems to have been found from time to time.

The rocks in this locality present a peculiar streaky appearance, from veins of black tourmaline in compact hornblende.

I had not an opportunity of prospecting this country thoroughly, but from observations I did make, I think the prospector might do well to turn his attention to this quarter.



This district is also rich in other minerals, as, for instance, copper, which exists in considerable quantity; and there are likewise hills of clay slate, with numerous quartz veins of a highly promising character. Then there exist a number of "ironstone blows," which may contain gold; and it is very probable that silver, copper, and lead will be found in them when the water level is reached.

**The Mallina.**—In 1888 some very rich stone was found at this place, which is nearly in the centre of the colony of Western Australia. It lies about 82 miles from Cossack, is 75 miles east of Roebourne, and about 25 miles south from the nearest sea-coast.

The Mallina claim, which is being worked by a London company, consists of 25 acres, being 2400 feet in length and 454 feet in width. In this district there are two outcrops of quartz—the first a large white reef, forming a hill east and west; the second is a small reef on the south side, from 9 inches to 2 feet in width, following the contour of the hill, and dipping slightly towards the larger reef. Both contain antimony in moderate quantity.

In the smaller reef gold was first discovered, and so rich did the find prove that it was decided to sink a shaft on the large reef and cut the junction, as intersections frequently contain bunches of exceptional richness. A shaft was therefore sunk 27 feet on the south side (foot wall) by the cap of the large reef, but with no success, as down to that point no stone was struck. A drive was therefore put in to the north on this level to test the main reef, which

here proved to be slightly over 10 feet wide, and of so greatly improved a character that the work of testing it was carried on in a westerly direction by a series of steeps. The reef improved in this direction, carrying gold in the solid stone.

My report, from personal inspection of this property, is dated October the 9th, 1892, and I consider the property to be of exceptional value. All that is required is sufficient working capital and competent metallurgical skill.

One hundred and three tons of stone, when treated by the crude system of amalgamation, yielded an average of over 3 ounces per ton of free gold. Thus only a fractional portion of the gold was taken out. I have known antimonial ores which, if treated properly, would have yielded some 10 ounces to the ton, having produced from 1 to 2 ounces by amalgamation, and there are to my certain knowledge stacks of tailings on the Mallina which will prove extremely rich under scientific treatment.

The trial sinkings here consist of eight shafts, which fully testify to the wealth of this exceptional claim, and proving the reef to extend over 1000 feet.

Another important advantage is that a plentiful supply of water can be obtained at a depth of 70 feet, and plenty of timber is procurable on the Peewah River, at four miles distance by a level road.

This notable property has been acquired from the original lessees by the Mallina Gold Mining Company, who have good reason to expect splendid results.

My sojourn at Mallina gave much food for reflection. Here I beheld one of the richest associations of gold and antimony which could be found upon the globe; but for want of the necessary appliances and knowledge Mother Nature refuses to surrender her treasures.

Wonderful are the ways of mining companies! Directors who know little or nothing of their business employ *experts* who know very little more. Then all sorts of expensive plant are sent out and erected—batteries, tables, and what not—and behold! there is failure—for some such simple reason, as that mercury will not amalgamate with any but the cleanest gold, and then only readily with that under favourable conditions of temperature, &c. Ah! that thief mercury: what a great deceiver he has been to gold diggers! The mill man serenely smokes his pipe under the pleasant impression that the quicksilver is doing its work, and collecting for him all the shining particles through which it is so nimbly running to and fro; while all the time the restless metal has been only busy “choking” itself by the endeavour to assimilate all the base metals within its reach. There is perhaps a slight sulphurous coating over the golden atoms, which hermetically seals them up so far as mercury is concerned; or the pure metal is in combination with a base one, or with salt. In short, only the purest gold, associated with the cleanest rock, will readily yield to treatment by mercury or the ordinary chlorine and cyanide solutions. Auriferous antimony is certainly

not the sort of combination to be so treated. In my whole experience I never met with such an attempt to compass a big thing with small outlay ; everything was being done about as badly as it was possible to do it ; and yet this property might, under proper treatment, astonish the whole world. I could write a very long story of how the diorites have played a noble part in packing rich bunches of ore, and how the hanging wall becomes so much richer than the foot wall, and why this immense mass of "lode stuff" will go down to such a great depth.

What should be done where antimony is present, is first to separate it from the gold by gently roasting the ore in a reverberatory furnace—of course taking care to collect it again for commercial purposes after it has "evaporated" at a low temperature—and then to "run down" the ore so roasted, from which it will then be easy enough to separate the gold. Or it could be managed by a simple plan of my own invention, which, so far as it has yet been put in practice, has given satisfactory results. This is, briefly described, a process of decomposition by fermentation—the ore being thrown into large vats and "worked upon" by chemicals and a strong electric current—which, after some three weeks' treatment, leaves the gold in a very free state indeed, when of course it can be readily collected by simple washing. Pardon me, reader, if I have said too much, but I find it hard to be silent when I think of the Mallina's buried treasures.

**The Flat Reef.**—This claim is about half a mile

from the Mallina gold mine, and is probably a parallel. Its name is derived from the appearance on the surface of a strong outcrop of quartz. The quartz shows gold very freely, and thousands of tons are visible. It is mixed with small quantities of stibnite, senarmontite, and scheelite.

When the Mallina works are fairly started, great results may be expected from this valuable property.

**Peeawah.**—Some 5 miles to the east of the last-named mine a find was made by Wells & Company. It consists of a small reef, from 2 to 3 feet in width, dipping to the south. The stone is rich, averaging, according to samples assayed, some ten ounces to the ton. Several other areas were taken up in this neighbourhood which have been abandoned, chiefly owing to difficulties in dealing with ores, and perhaps through the superior attractions of other districts.

**Egina.**—This field is situated on the east side of Peeawah, about 40 miles from the coast. It was here that the first discovery of alluvial gold was made in 1888 in this part of the colony. The field is a compact patch of shallow diggings amongst slate hills containing very little quartz. The patch extends a few miles south, and to the westward in the direction of Croydon, but scarcity of water has sadly interfered with prospecting. It is in many respects similar to the Ashburton.

**Pilbarra.**—This is a narrow belt of auriferous county, about 12 miles to the south-east of Egina, about 2 miles in width, and running in a north-east

and south-west direction. The gold is not water-worn, and has been found in rich but limited patches almost on the surface, where it has been left when the quartz from the rich leaders was washed away.

**Broken Reef** was an important feature here, and several claims were taken up, upon one of which was erected a Huntingdon mill.

There are no true veins on this field, the reef masses being lenticular segregations, which are not likely to extend to any great depth.

Pilbarra was once the scene of an extraordinary "blow," the gold being deposited all over the surface in rich patches. It was altogether too good to last, however. In mining slang Pilbarra did not "hold down."

**Just in Time** is situated about 190 miles east from Roebourne and 10 miles from Marble Bar. There is an extensive out-crop of conglomerate and ferruginous quartz, which shows gold freely.

One very important point here is that throughout the vast amount of ore, gold exists in its native state, and has no associated minerals to interrupt manipulation. Thus can the metal be won with special economy, and I do not hesitate to prophesy splendid results in this quarter.

## MARBLE BAR AND BAMBOO CREEK GOLDFIELDS.

THE field lies in a nest of low sandstone and slate hills, to the east of the Coongan River, and is distant from Roebourne about 275 miles.

No field that I have visited, and no district that I have studied the reports of, appears to me to hold out more brilliant prospects for the future.

Without that modicum of assistance accorded by the Government to other and far less deserving fields, the Marble Bar Reefs have abundantly proved their quality. Both this field and its neighbour, **Bamboo Creek**, were opened up by ideal pioneers among the gold finders, whose innate perseverance and indomitable courage led them to penetrate far into the wilderness, and encounter inevitable distresses in these distant wilds. To these men, whose chief capital was their strong arms and stout hearts, may be attributed the early success and development of these fields.

The miners of the Marble Bar were conscious of Government neglect. Says a writer in the *Nor'-West Times and Northern Advocate*.—"We were told to prove our mines payable and the Govern-

ment would lavish money on them, as they had done and are still doing at Yilgarn. The Marble Bar field has long since been proved, but nothing further than promises from Ministers, intended only to keep us quiet, have we received. We are tired of listening to these Ministerial promises. We have been gulled long enough by them, and shall not be satisfied on this point until we have had those promises fulfilled. We have completed our part, and the least the Government can do is to act uprightly towards us. Wire and material has, we are told, been indented for our promised telegraph line from Condon to Marble Bar; this work should immediately be taken in hand. But, although we have been meanly treated, we have shown to the Southern Government that the northern miners are not a class to be easily disheartened or despised. It was undoubtedly the surface indications that spurred them on to work the mines so indefatigably from the commencement. Now we can boast of holding the two most important goldfields in the colony, besides the well-known Mallina mine, which is now about to be worked again and on more advantageous lines to those under which it was attempted to be worked by the former holders."

Shortly following the established proof of the richness and permanency of Marble Bar, I heard of the phenomenal yield from the first crushing in Bamboo Creek of 12 ozs. to the ton, and this was not from picked stone.

Again, I reprint from the same well-conducted



though diminutive four-page newspaper, published at Roebourne, and costing *sixpence*, another article of interest on the subject of an application to Government for assistance in the development of these fine reefing fields. It is dated October 29, 1892, and expresses graphically the sentiments of the miners at that time. It runs as follows:—

“The two meetings held at the Marble Bar with reference to the importation of machinery to test, or rather to publish the richness of the reefs, appear to have misled the public as to the real condition of things. It has been presumed that because Mr. Francis was unable to obtain a guarantee from the mine owners of a few hundred tons of stone to crush, that the amount required was not at grass. This is far from being the case. Immense quantities of auriferous stone have been raised, which the proprietors are only too anxious to have crushed, but Mr. Francis' offer came too late; offers having been already accepted from other people, which are still in force, and which bind the owners to keep their stone uncrushed until the time expires which has been allowed to the guarantors to place their machinery on the fields for public crushings. That the application to the Government to place a public battery on the Marble Bar reefing-field proves any distrust of the value of the reefs, we emphatically deny. The only reason for applying to the Government is, that they are in a position to crush at a cheaper rate than a private individual, as they only require to make enough to pay wages and the interest

on the capital expended ; while a private individual or company looks to paying off the principal in the shortest possible time, and therefore must charge more, and it is only natural that the owner should desire to deal in the cheapest market. Yilgarn, crushing 15 dwts. to 1 oz. of gold to the ton, has its telegraph line, and will shortly have its railway, while the Marble Bar and Bamboo Creek reefs, yielding three to four times as much gold, has had no public money expended on it except that necessary to sink a shallow well. The reason is not far to seek. Here the shareholders are practical miners without capital, working hard enough to hold their claims, and not influential members or friends of the Government. Facts are stubborn things ; and in this case they most conclusively prove that a handful of men have done all they could to develop the resources of the country and to increase its wealth, and it will be hard indeed if they are not enabled to reap the reward of their labour. They are not beggars, they simply ask the Government to enter into a business transaction profitable to all concerned. When asked to erect a public battery on the Yilgarn field, the Government said they could not enter into competition with private enterprise ; here there is no question of this, as Messrs. Francis & Co., as well as the Coongan Co., have enough stone of their own to crush for some time to come. Since the meeting was held, however, the latter company have sent for another mill, which will be available for public purposes, but it will be

a very long time before it can be expected to get through enough stone to test all the reefs, twenty-one of which have already been opened. As 30 tons is considered a fair average test, this means that 630 tons at least must be crushed, a task which at the present rate will take a Huntingdon mill from nine to twelve weeks. With regard to the other chief want mentioned at the second meeting—the opening of Port Hedland—there can be no question as to its advisability. At present importers on the fields have to pay lighterage from Cossack roads to the jetty, and from thence to Condon, where small boats only can come into the creek. With a small wharf at Port Hedland, steamers can discharge their cargoes without the intervention of any lighters, while the road from that port to the fields is only 20 miles longer than that from Condon. Many things were promised us when we had a permanent goldfield. There can be no doubt that a large settled population will be found on the Marble Bar and Bamboo Creek fields for many years to come. The time has therefore arrived for the Government to recognise and assist to develop these producers of national wealth, especially when it can be done at no pecuniary loss to the State, but on the contrary at a fair profit directly, besides the indirect benefit which will accrue to the country; and we have no hesitation in predicting, that once machinery is established on the fields our quarterly export of gold will be second to none in the colony.”

Again, I find a representative meeting held at

Marble Bar a few weeks ago, to consider the question of petitioning the Government to put on additional mail service, and stating that there are over 200 permanent residents on the two fields of Marble Bar and Bamboo Creek. Then great indignation is expressed at the delay in accepting tenders for their telegraph line.

To abruptly change the subject, I find that the Marble Bar Eleven was to play the Condon Cricket Club during the coming race week. This looks like progress. A short extract from a Roebourne paper referring to Bamboo Creek is instructive, as showing how justice is administered in that small distant community:—

“ BAMBOO CREEK.

“ BAMBOO CREEK GOLDFIELD, *May 30.*

“The Warden arrived here on the 12th inst., and was kept very busy for ten days. After having dealt with the few cases he had to hear on the field, word came in that P.C.s Crockett and Fee were at Eel Creek station with a batch of natives, and the Warden decided to remain here and try them at once. There were twenty-four in all, charged with offences varying from absconding to murder. The first case was tried on the 19th, against Brummie, who was at one time with Mr. W. Ball, for the murder of one of Messrs. Ball Bros' native shepherds, his woman, a young girl, and a picaninny. The evidence went to show that the prisoner, with four other blacks, who are still at large, came into

Ball's station about August 9th last, and committed the horrible crime. P.-C. Crockett produced some ghastly relics of the deed in the shape of skulls and bones. Prisoner declined to say anything, and was committed to take his trial at Roebourne at the September criminal sitting of the Supreme Court. The next case was that of Brummie and Frank, charged with the attempted murder of Mr. E. A. Mitchell and P.-C. Crockett. Both the prisoners were committed for trial on this charge. The charges against the other natives were for minor offences, viz., robbing Warburton and Rodger's station, and killing sheep and cattle. All were convicted and sentenced to terms of imprisonment, ranging from six months to two years, with hard labour, in Roebourne gaol.

“ It is imperative that the settlers of this outlying district should have police protection. The natives, and their name is legion, whose haunts are on the boundaries of Messrs. Mitchell's and Ball's runs, will assuredly in the near future try to avenge the deaths of their fellows who were shot in this unfortunate affray, and they will not be particular whom they select as their victims. The nearest Justice of the Peace, with the exception of the Warden, who is migratory, is in Roebourne. Now, if one were appointed for the Upper De Grey (and I am sure there are suitable gentlemen in the vicinity who would condescend to act as such), what an infinity of trouble it would save the community. Without considering the advantages to be gained by his

issuing warrants, citing natives, &c., he could, when occasion demands it, as it will one of these days, swear in special constables, who would not be 'backward in coming forward' if required.

"Splendid rains have fallen all over the Upper De Grey, and the country is looking splendid."

Strange indeed it is that the south, and the south only, have received consideration and assistance from the Government. In looking over the report on the Murchison goldfields for 1893 of the Government geologist, to whom I am much indebted for information, I notice he dismisses the Pilbarra district in *one line*: "Pilbarra and Ashburton," he says, "have neither proved yet to be large reefing districts, so need not be mentioned." And this after sixteen folios of foolscap have been devoted to the Murchison. Surely the Government cannot be blind to the fact that Western Australia's goldfields are what she has chiefly to look forward to; and, in order that she may stand on a level with her eastern sisters, these must be encouraged and fully developed. Indeed I go so far as to say, that if this be not done, and the facts of enormous mineral wealth of the colony be not advertised to the world, the authorities are disregarding the best interests of Western Australia.

Another point, however, I should like to touch upon here, and that is the responsibility which rests upon the mine-owners. It is vitally necessary that both the Government and the public press should be supplied with adequate information, and unless they

thus assist in promulgating the resources of the fields by supplying crushing-returns, &c., they will never be given that advertisement among capitalists of the world which their importance demands. I well know that legislative encumbrances are in the way; let me hope that a full co-operation will eventually exist between the mine-owners and the Government.

Marble Bar and Bamboo Creek seem to feel their neglected condition keenly; and I am told that Mr. Nicholls, one of the owners of the "Welcome Battery," in the course of a speech on the occasion of its being opened, made the following remarks:— "Marble Bar is not known in Melbourne. People do not know if it is in Africa, or even farther away." (April 24, 1893.)

Surely this is overstating the case. Let me hope, however, that ere long the names of Marble Bar and Bamboo Creek will not only be known in Collins Street, but well known in Throgmorton Street and the London Stock Exchange.

To turn to another subject, I notice by latest mails that the Under-Secretary for Lands has received the following report, dated June 6th, from Mr. L. R. Davis, Warden of the Pilbarra goldfield:—

"I beg to inform you that skilled miners are very scarce upon both the Bamboo Creek and Marble Bar fields, and in consequence the development of the properties on these fields is very much retarded. The wages given are £4 per week for miners and £3, 10s. per week for top-men and hammermen. Messrs. Francis and party decided to smelt their

gold here instead of sending it in bulk to Melbourne.”  
— *West Australian*, July 1, 1893.

I think I have said enough to convince any one that the men of Marble Bar and Bamboo Creek mean business. They have overcome stupendous difficulties, and, in spite of hardship and neglect, have picked a fairish share of gold from the broad breast of Western Australia.

I could scarcely separate Marble Bar from Bamboo Creek in the foregoing short general description, but as they are some 60 miles apart, I will now give some particulars concerning each under distinct headings.



## MARBLE BAR GOLDFIELD.

THIS district is situated close to the Coongan River, about 200 miles east from Roebourne, about 100 miles south from Condon Port, and about 115 miles south-east from Port Hedland. The country between the coast and this property is fairly level, and without any obstacles, and there is a very fair water supply. The reef runs north-west and south-east, dipping to the south-west, and is a cross course, making a junction with the champion reef of the country, which runs nearly north and south.

Geologically speaking, the belt of country to which this goldfield belongs is on the western slope of a granitic range, and on the opposite side of the belt bosses of greenstone (diorite) occur, having on the out-crop a basaltic character. Where the boss of diorite has forced the intervening schists against the granite, a decomposition has taken place, resulting in the formation of serpentine and talc. The great fissure vein shows enormous strength, occasionally cropping out boldly to the surface.

The great champion reef is strongly charged with iron, and immense quantities of native gold have been precipitated in several places in the ferruginous quartz. I also found bismuth and gold upon the cross course.

The reef is much tinged with green and blue carbonate of copper, and the lode stuff is well spotted with visible native gold, frequently associated with needle ore bismuth (aikinite). I may here remark that this association occurs in several parts of the globe—at Beresof, near Katharinenberg, Siberia; at Georgia and Goldhill, North Carolina, in the United States; and elsewhere. It has always indicated extreme richness wherever found, and I do not think Marble Bar will be an exception to the rule.

When last I visited the place the town site consisted of two galvanised iron houses, occupied as public-houses and general stores by Messrs. Osborne and Co. and Mr. J. Reed, and a number of bush huts. It is situated on the north-east bank of a small creek, the Warden's house and police camps being on a rise on the south-west side.

Two miles further in the latter direction is the "Bar," from which the workings take their name. It is a somewhat picturesque spot on the Coongan River, where two or three pools are divided by high walls of variegated rock in red, black, and white bars regularly traversing it. The scenery is almost romantic here in contrast with the unvarying flatness of the road leading from the coast. The main road runs *via* Fisher's Meares and Withnell's, Mackay's, Wedge's, the De Grey, and Robinson's Wayside Inn, though most travellers strike across from the Nullagine Road to the Bar.

The richly auriferous nature of the country is not

apparent just at the town site, nor are the workings visible. Within a short walk, however, I found the first of the claims—that is, the most northerly on the line.

I shall not attempt to do more than give a very brief sketch of these properties, except, perhaps, in one or two instances, and even then I shall confine myself to a few general facts.

**The North Australian.**—This is a 12 acre lease held by Messrs. Fox & Co. There are three distinct reefs on this claim, the widest being 7 feet thick, and the general run is north and south with a westerly dip.

The gold is chiefly found in the ironstone, which is a good indication of the metal on this field. Sulphuret of lead is also conspicuous through much of the gold-bearing stone.

**Band of Hope.**—This property adjoins the last named claim to the south, and is held under lease by Hodges Mayer & Sons.

Several shafts have been sunk, showing an average reef-width of 4 feet 6 inches right through. Ten or twelve feet down, the character of the stone changes for the better, and random pickings give a handsome show.

The reef in the main shaft increases from 5 to 7 feet, and the owners estimate the average yield at 3 to 4 ounces to the ton.

**South Australian.**—This claim lies next to the southward, and is held by De Lacy Turner & Co. It has an area of 6 acres, and the reef runs north and

south, the underlay being about one in four, dipping to the west.

Very good stone has been raised on this property, the lode being a continuation of the Ironclad, to which I shall refer. Two shafts have been sunk with highly satisfactory results.

**The Ironclad.**—This is a highly promising claim, consisting of 18 acres, and is held by Messrs. Isdell, Matthews, & Co. The reef runs north and south, with an underlay of about one in four, dipping to the west. Several shafts, varying in depth from 30 to 70 feet, have been put down along the line of reef, which has been proved to be about 4 feet wide. Out of 1 ton of stone the owners drolled 15 ounces of gold, and 51 tons of ore treated by the Huntington mill gave a return of 143 ounces.

**The Ironclad South** is a 6 acre claim adjoining the above property. The reef runs north and south, with an underlay of about one in four, dipping to the west. Wherever the reef comes out to surface it is fairly rich, giving an average of from 2 ounces to 3 ounces to the ton. It has been tapped in several places, and at present a shaft is being sunk, and has reached a depth of over 20 feet; but although it has not yet struck the lode, it will probably do so within the next few feet.

**The Bohemian.**—This claim consists of 6 acres, held by Jenkins, Garlieth, & Co. There is an outcrop of good stone, and prospects are very promising.

A trial crushing of 30 tons gave a return of about 2 ounces to the ton.

It lies to the south-west of the Ironclad, and seems to share a continuation of the same reef, as also the reef running through the Iron Duke claim, which is immediately adjacent.

**The Iron Duke.**—This is a 12 acre claim, lying to the south of the last named. There are two reefs running north-east and south-west, with a southerly dip. Two shafts have been sunk, the stone from one reef yielding 1 oz. 15 dwt. to the ton, and from the other about 1 ounce.

The owners are the Coongan Amalgamated G. M. and C. Company.

**The Patent Log** is a 5 acre claim, held by Messrs. Pead & Jenkins. The reef runs east and west, and has been proved to a width of 20 inches, being nearly vertical.

A trial crushing of 30 tons gave a return of 3 ounces to the ton.

**Westward Ho!**—This is a 5 acre claim, adjoining Patent Log, to the westward. It is on the same reef, which dips to the southward.

**The General** is an irregularly shaped claim, adjoining the south-east corner of the Iron Duke. It consists of 6 acres, owned by Messrs. Binnie, Francis, and Laurence. Two reefs come to surface, the first being 2 feet thick and the second having a width of 3 feet. A shaft following these two lodes down has reached a depth of over 60 feet, and is nearly vertical. Sixty tons of stone have been crushed, giving an average of 5 oz. 7 dwt. to the ton.

**The Contest** is held by the Coongan Amalgamated

G. M. & C. Company, and has an area of 6 acres. Here there is a big gold-carrying outcrop or quartz blow, some of which reached  $6\frac{1}{2}$  ozs. to the ton. Several small leaders have likewise been worked, and 64 tons of crushings gave a return of 201 ozs.

I should recommend the Company to put a drive in a north-easterly direction through the hill, starting from the shaft already sunk to cut lode on the adjoining general property, which probably traverses this claim.

**Augusta.**—This claim extends over an area of 18 acres, held also by the Coongan A. G. M. & C. Company.

Three distinct reefs traverse this property.

The first has been proved to have a width of 4 feet 6 inches, and the stone raised therefrom gave results between 1 oz. and  $1\frac{1}{2}$  oz. to the ton.

The foot and hanging wall have in places yielded some remarkably rich stone, with a very free show of gold.

The middle reef is about 2 feet wide, and is richer than the first mentioned. A large quantity of ore has been raised from this, and has all the appearance of yielding 4 ozs. or 5 ozs. to the ton. The third reef measures about 1 foot in width, and the stone appears saturated with gold throughout.

The largest of the reefs has been proved for a distance of about 1000 feet, and there are many leaders on the property.

With energetic and skilful management, conjoined

of course with adequate capital, this mine should prove one of the most remunerative on the Marble Bar goldfield.

**Stray Shot.**—This is a 6 acre claim, owned by Francis Jenkins & Edmondstone. It lies to the westward of Augusta, the middle reef of which, dipping to the south, traverses it. There is likewise a reef running nearly north and south, and dipping to the south-west. This mine has produced some stone of exceptional richness.

**Homeward Bound.**—This property consists of an 18 acre lease held direct from the Government, Messrs. Roe & Galbraith being the present lessees.

I had a special opportunity of observing the natural features of the claim, having been asked to report upon it.

The rock in which the reefs and leaders occur consists chiefly of slate and schist, mostly micaceous, intermixed occasionally with serpentine, and running across to a granite country.

The gullies have proved rich in alluvial, probably shed from the large reef No. 5, where it is broken away. This I infer from the fact that the gold has been mostly "specimen," very little water-worn, and can be traced up to the reefs.

There are no less than five reefs.

No. 1 shows on the surface for about 100 feet, the outcrop being 12 to 18 inches wide, and has yielded some promising stone.

No. 2 is smaller, being only 10 inches wide, but has bigger blows. This has scarcely as good a

surface show as the former, but should pay well for crushing.

No. 3 was recently found, and exhibits as rich a stone as is on the Coongan.

No. 4. This is a flat outcrop of a good-sized reef, and the stone has a very good appearance.

No. 5. This big reef traverses the entire claim, measuring from 12 inches to 4 feet in thickness.

There is here an immense bulk of good stone showing gold freely.

Considerable work has been done on the north-west boundary of this property on the outcrop of No. 5 reef, which runs nearly north and south. Another cutting on the same outcrop, 20 feet in length, shows a good reef 5 feet wide, and a third, for a distance of 25 feet, shows an increase of 6 inches in the width. A fourth cutting, also of 20 feet, gives a result of 5 feet. A shaft to the depth of 35 feet vertical shows the reef with a well-defined hanging wall, and though only broken into about 2 feet 6 inches, gives no reason to doubt that the width of the reef continues uniform.

The reef underlays at an angle of about  $25^{\circ}$ , and as I have already stated, an immense body of stone can be economically raised.

Quartz veins of various sizes crop out, which have not yet been fully examined.

At the south-east corner, a leader has been worked for a distance of 60 feet, and two shafts have been sunk to a depth of 12 and 15 feet respectively, and exhibit a regular lode formation about 2 feet wide.



The stone raised from this portion is of high gold-showing quality.

Another drive having been put in toward the west, shows a reef averaging 20 inches wide for a length of 35 feet.

I have already exceeded my limits in describing this claim, which I regard as one of the most promising and valuable in the Marble Bar district.

## BAMBOO CREEK GOLDFIELD.

THIS field was discovered soon after Marble Bar, from which it is distant about 60 miles.

I have already spoken as to the prospects of this magnificent goldfield, and feel that I cannot now do better than quote the words of the Acting Warden in his report to the Commission of Crown Lands.

### “BAMBOO CREEK.

“A great many claims have been registered in the neighbourhood of Timbuctoo Reef (the first discovered in this locality, which is about 20 miles south of Mr. Coppin’s Eel Creek station on the De Grey River), upwards of fifty men’s ground being held altogether, and the show of gold in some of them, notably the P.C. No. 1 East, and Byass & Co.’s claims, being very good indeed.

“The greatest number of claims are taken up on the Timbuctoo Reef, or lode, which in some places is 50 feet wide, showing gold all through, and with leaders running through it, from which the holders inform me they dolly 100 oz. to the ton.

“Wells have been sunk in three places, viz., on Schlinke & Taylor’s water right, where a good supply has been obtained at about 30 feet, one at Middle Camp, 60 feet, without water, and one on Byass & Co.’s claims, 100 feet, with only a very small supply. Messrs. Schlinke & Taylor allow miners to use the water from their well for domestic purposes at 2s. 6d. per week per man.

“I believe there is a grand future for this part of the field, the only thing wanted being machinery to crush the stone, of which there seems to be an immense quantity. There is a good road of about 100 miles from this place to the port of Condon, but at present feed is very scarce upon it.”

Water is of course a source of anxiety here as in many other districts. Messrs. Turner, however, had a large contract for wells on Brockman’s Road to Condon, and these are probably now approaching completion.

There are some fifty claims pegged out, some working and others in abeyance for the time. Good work is being done on the Timbuctoo, the claims of Cook, Graves, & Co., and the Bamboo Queen. For lack of space I cannot do more than give a very short description of the last named; but a large volume might be written if full particulars were given of this rich goldfield.

**Bamboo Queen Mine.**—The property consists of a 6 acre lease. Work was commenced in June 1891, and since that time the owners have dollied sufficient gold out of the stone to meet all expenses, notwith-

standing the fact that a considerable amount of work has been done towards developing and prospecting the mine. The main portion of the work consists of three separate shafts and a long tunnel.

Shaft No. 1 is sunk to a depth of 60 feet, carrying gold from the surface, and over 300 ozs. of gold were taken from the stone raised while sinking was in process. A tunnel nearly 100 feet long has been cut from base of hill into this shaft, for the purpose of cutting any other reefs running through the ground, and also to render stopping easy. Two good-sized leaders were struck, each carrying fair gold, which pays for crushing at present time. It is thought these will widen out on being opened up.

Shaft No. 2 is down from 33 to 40 feet. A large amount of gold was also obtained while sinking this shaft from stone similar in appearance to No. 1. The reef is about 3 feet wide here.

Shaft No. 3, now being sunk, is down about 30 feet, showing very good gold. About 70 tons of stone are now at grass, waiting to be treated as soon as the battery is at liberty. One crushing of 60 tons has already been put through from Nos. 1 and 2, which gave nearly 7 ozs. to the ton; over 6 ozs. to the ton had before been dollied from this stone, making in all a total of over 13 ozs. It is anticipated that the next crushing will be almost equal to the last.

All these shafts are sunk on the line of reef dipping very slightly to the east, and varying in size

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from 2 to 5 feet wide, which is traceable on the surface from end to end of claim. In addition there is a water shaft 100 feet deep, in which is about 30 feet of water; there are also blacksmith's shed, and all mining requisites.

## THE NULLAGINE GOLDFIELD

Is situated on a creek of the same name, which is a branch of the De Grey River. By road it is some 300 miles to the eastward of Roebourne, and about 120 from the coast.

Alluvial workings of three classes occur.

First, the alluvium of existing creeks.

Second, the alluvium of older creek beds, but in conjunction with present streams.

Third, old alluvium deposits, or deep leads, bearing no relation to existing streams or configuration of the country.

All three deposits are very rich, and the more recent deposits very easily worked. It is therefore certain that large quantities of unreported gold have been taken out in this quarter.

There is probably a grand future in store for this neighbourhood, though it is of a patchy nature.

In working the *Conglomerate*, diamonds so large as to fetch £50 to £75 have been found, and a lease has been granted by the Warden to Messrs. Brookes for the purpose of searching for these valuable gems.

Here are a few items of Nullagine news which may break the monotony of mere gold-mining details.

It is in the words of a correspondent to the *Nor'-West Times*:—

“The Warden arrived here, and was kept pretty busy with court cases for a week. There were four Warden’s Court cases, three cases of assault—one on a native woman, for which the delinquent was fined 5s. and costs; three cases against natives for being in the diggers’ camps for an unlawful purpose, resulting in their being imprisoned for six months each; James Pascoe was fined £5 for being drunk and disorderly, and was also put on the prohibited list for twelve months. There are only about sixty men on the Conglomerate camp, and they are doing very little, the majority only waiting for rain. There is only one cart, owned by Alf. Royer, carting dirt now. Water is very scarce, and feed is not to be got within miles of the camp. Stores were very scarce, and sugar was not to be had for love nor money until Moore & Quinn’s waggon arrived. Flour is 30s. per bag, and the price of provisions generally is high. There is plenty of liquor at the hotels, where English beer is 4s. 6d. per bottle. Moore and Quinn are killing beef, and Osborn & Co. mutton, but the meat is poor stuff. There are about sixty more men down the river, between this and Cooke’s Creek junction, spelling their horses and waiting for rain. Constable Maxwell is here, and has thirteen natives on the chain, including the native who tried to spear Harry Greene last August. Maxwell expects to start for Brockman’s on the 21st. No water was struck in the well at the Mary Ann at

100 feet, so that operations have been suspended. The Warden has offered a bonus of £50 to any one finding the best practical road from the Nullagine to Brockman's or the Marble Bar. If a road can be got straight through, it will reduce the distance to Condon to considerably less than 200 miles."

It will be seen that justice is sharply administered, and drunkenness punished with rigorous severity. What a contrast to an American mining camp, where drunkenness almost amounts to a virtue, in that it induces the miner to circulate the Almighty dollar! It must have been expensive work getting drunk on beer at 4s. 6d. per bottle.

I do not know if the same writer is responsible for the following, but I fancy I recognise his style of expression. I think I shall print this short extract from the pen of the Nullagine scribe; he seems to be a philanthropist and a philosopher.

"The dry weather, I am sorry to say, still continues. Last year about this time we had a glorious downpour of rain, and it is to be hoped that such another will come before long. All the carters, with the exception of one, have had to knock off carting, so the miners are for the most part engaged in stacking wash-dirt in readiness for the first opportunity of getting rain. There is no mistake this must be an out-of-the-way place, although it has had a fairly large amount of population for about three years. We have been visited by neither parson, priest, or petticoat; not that we have been without some of the gentler sex for the last twelve months



or so, but unfortunately they have been black. Till lately, when a few of the most comely and civilised ones have made extempore dresses of calico and other materials, they have been totally devoid of petticoats.

“The police made a descent on the natives the other day, and gallantly succeeded in capturing a few of the quiet ones that have been working for the whites. Arrests were made, I believe, in some cases by virtue of warrants of long standing. One native, who has worked for me and others fairly and honestly for about twelve months, is amongst the number. The ones that have been the principal thieves, of course, as is usual, got away. It is getting time that something was done in the way of giving the unfortunate wretches some chance of getting justice or some protection. I certainly hold that the thieves should be taught a lesson, but there are faults on the side of the whites here as well as the blacks. In one instance an unfortunate woman was scalded with hot fat, and no less than a day or two ago another unfortunate woman was beaten for some imaginary offence. It is to the credit of the mining community here that with this last cowardly exception, the blacks have been treated as a rule kindly and manfully. It is to be hoped some one, in the interests of humanity and the welfare of the colony, will pay this place a visit. Missionaries are sent to outlandish places to preach the Gospel and civilisation, while here, at our very doors, is an opening for doing good to a large number of totally unprotected human beings. There are a great many

children with the natives here, showing that as yet their contact with the whites is recent. There is also imminent danger of the poor wretches getting drink supplied to them. There are three places here licensed to sell liquor, and the blacks are allowed to be continually hanging round about them on one pretence or another. I do not mean to imply that any one has been mean enough yet to supply them with liquor, but that does not remove the danger."

## KIMBERLEY GOLDFIELDS.

I COME now to the last of the great proclaimed areas of Western Australia under the "Goldfields Act, 1886." Although I place it last in sequence, owing to its geographical position, I might well have adopted a chronological method and placed it first.

As I have stated, the presence of gold in paying quantity was strongly suspected. The scent of bullion was in men's nostrils, and expeditions were despatched by the Government to probe the question to a definite issue. So far back as 1882 the late Mr. Edward J. Hardman, F.R.G.S.I., Government geologist, had actually discovered the existence of gold in the Kimberley district. The subject may be said to have slept for three years, when it was revived, and gold prospecting began in earnest.

Meanwhile, Governor Broome sent the Honourable John Forrest, Surveyor-General and Commissioner of Crown Lands, to survey the Kimberley district, and from the 13th of April to the 28th June 1883, he made investigations and reported to His Excellency.

He was accompanied by Mr. Hardman, who, in a report dated April 21st, 1884, thus states his views:—

“So far, search in this direction in West Kimberley has not been rewarded by any success. However, it must be borne in mind that the circumstances under which the survey was carried on did not allow of anything like a systematic examination for gold or other valuable minerals, and the fact that none were actually observed by no means proves their absence. On the contrary, I consider it extremely likely that that part of the district occupied by the metamorphic rocks will eventually prove to be, in some degree at least, auriferous: it may be in payable quantity. This question can, however, only be settled by those who have time and means to undertake a proper and probably prolonged search. The district I would recommend for such prospecting work is that between the Napier Range and Mount Broome, on the Lennard and Richenda Rivers. The most promising portion of this being about 10 or 12 miles up, where the principal slate country commences. The whole section along the river between the two points above-named exhibits, as already mentioned, continuous exposures of metamorphic rocks. The lower part passes through gneiss principally, with some garnetiferous schists at intervals, and this is succeeded by fine grained micaceous and talcose slaty schists, continuing for many miles. In this section very numerous quartz veins may be observed, varying in width from a few inches to 30 feet. The quartz is of various character, usually milk white, often colourless, and sometimes coloured with various oxides of iron.

Their general bearing appears to be N.W. I much regret that the limited time at my disposal, and the urgent necessity for pushing on, prevented me from devoting more time to the examination of this part of the country, as I am convinced that if gold exists at all in the Kimberley on the west side of the Leopold Range, it will be found somewhere in this locality. It is to be hoped that the examination of the rocks of the Ord district, where gold has been reported, will enable a more definite conclusion to be arrived at with regard to the probability of that metal being discovered on the west side of the ranges.

“EDWARD T. HARDMAN, *Government Geologist.*”

Mr. Hardman, it will be observed, was now on the track. Next year he took up the scent, and ran his quarry to earth. From his report of 1885 may be dated the commencement of the Golden Age of Western Australia.

Although somewhat lengthy, I think I cannot do better than transcribe what must always be a treasured document in the archives of the Colony:—

REPORT BY EDWARD T. HARDMAN, GOVERNMENT  
GEOLOGIST, *dated Perth, 1st August, 1885.*

“I am glad to be able to report that I have discovered a large area of country which, I believe, will prove to be auriferous to a payable degree. This country is traversed by the Margaret, Mary, Elvire, Panton, and Ord rivers, and comprises an area of

at least 2000 square miles so far as observed, but it doubtless continues over a much greater extent of country. The formation is principally Lower Silurian slate and schist of various kinds, traversed by an enormous number of quartz reefs. In some localities many of these occur in the space of a few hundred yards, and it was quite usual to notice twenty-five or thirty large reefs while riding over a mile of ground, without taking into account the smaller reefs or veins. The quartz constituting these reefs is of a very promising character. It is a dull yellowish and grey quartz, very cellular and vuggy, containing quantities of black and other oxides of iron, together with casts of, and often crystals of iron pyrites. From most of the surface quartz the enclosed minerals have been washed away, however, although their traces are still apparent. Minute specks of gold have been noticed in a few cases, and I have very little doubt that many of these reefs, when properly examined and tested, will prove to be auriferous.

“These quartz reefs have a general bearing of N. and E. to N.E. Many run due N. and S. Some of them can be traced for several miles.

“It is most probable that these quartziferous rocks are a spur or continuation of the gold-bearing metamorphic rocks of the Northern Territory of South Australia, now being worked with some success.

“*Alluvial Gold.*—The river valleys and flats are in many places covered with deposits, sometimes very extensive, of quartz-gravel and drift, the quartz

being derived from denudation of the reefs referred to above. I have prospected these gravels over many miles of country, and I have rarely failed to obtain good colours of gold; in many localities of a very encouraging character. Very often good colours were obtained in every pan washed, in different trials in the same locality. I have thus found gold to be distributed over about 140 miles along the Elvire, Panton, and Ord rivers, &c., as well as on the Mary and Margaret rivers, where the indications were very good, and the appearance of the country most favourable.

“In several instances I obtained good colours of gold at considerable distances from the quartz-bearing rocks, from which the gold could only have been derived. This to my mind seems to indicate that there must be large quantities of gold in the quartz-bearing rocks, and in the drifts immediately overlying them.

“The gold-yielding country is well watered by numerous rivers, creeks, and gullies, which even in the driest part of the year are never wholly without water. And although during the dry season water is scarce, there would be no difficulty in conserving water anywhere in sufficient quantity for all mining purposes.

“On the whole, the indications I have met with point, as I believe, to the great probability of payable gold being obtained in this part of Kimberley, and are, I consider, sufficient to justify the expenditure, either by the Government or private individuals, of

a reasonable sum of money in fitting out a party to thoroughly test the country, and I should strongly recommend such an undertaking. I would also suggest the advisability of parties going up for this purpose providing themselves with some simple apparatus for crushing and washing some of the reef quartz, as in one very rudely conducted experiment of this kind I obtained a small quantity of gold.

“The principal reef-bearing country extends on the east of the watershed between the Ord and Margaret rivers. It has been traced from about latitude  $16^{\circ} 45'$  S. to nearly  $19^{\circ}$  S., and as the alluvium and river gravels have yielded good colours of gold whenever they could be tested, which was generally at every camp, there can be no doubt that many of the reefs are gold-bearing.

“Excellent colours were obtained in several localities on the first portion of the Elvire, which passes through these rocks.<sup>1</sup> And in the lower portions in the gravels resting on the Devonian rocks colours were obtained in almost every place tried.

“At the junction of the Panton and Elvire, near J 34, good colours were obtained in several places. Just south-west of J 34, I sunk several holes and obtained large specks of gold in every pan washed out.

“On the Ord River, although far from the slate country, from which alone the gold is likely to have been derived, I obtained from the river gravels good

<sup>1</sup> Extremely good indications were met just west of the gorge in the Albert-Edward Range, so often referred to.



colours in many places, down to where we left off work near Mount Deception.

“Here the slate rocks with quartz reefs come in again, and appear to continue for a long distance to the N.W. and N.E., as indicated on the map.

“The gravels along the Ord and Elvire are full of fragments of quartz, containing a good deal of black iron, sand, and some pyrites.

“Some of the quartz collected near J 28, on the Elvire, was roughly crushed in a very primitive manner on a large stone, by means of an axe head ; and, the result being washed, yielded some specks of gold. Gold was also observed in very tiny specks in a quartz reef at Mount Coghlan, and in one near J 26, on the Elvire.

“About three miles from the last station, on the road to J 27, numerous quartz reefs are seen, and the ground is strewn for some miles with a thick deposit of quartz gravel, which, to my great regret, I was not able to examine.

“I have previously mentioned the fine appearance of the quartz reefs in the country near Mount Dockrell and J 22. At Syenite camp, on the Mary River, which drains a great part of this district, I found in the river gravels excellent indications. I had only time to wash out two pansful, and in both I found several pieces of shotty gold.

“In the Margaret River, close to J 11, I found faint colours. The washing here, however, was accomplished under very unfavourable circumstances, and with better facilities I should expect

good results, as the rock indications are very promising. The possibly metalliferous character of the metamorphic rocks of this district, which extend for many miles along the south of the Leopold ranges, has been already commented upon. In all likelihood they are auriferous in places. They occupy, however, but a secondary position when compared with the immense extent of reef-bearing slate country to the eastward.

“As a guide to those who are likely to take an interest in following up the indications which I have been able to obtain, I have marked the principal reef-bearing and gold-yielding districts with gold lines and gold dots respectively. The country below the Crater Pass in Albert-Edward Range, along the Elvire and the Ord to Mount Deception, is exclusively alluvial, overlying Devonian rocks in which no quartz reefs of any size occur. Some of these gravels, which have been already described, are not unlikely to contain payable gold.

“I have great hope that this district will prove a success as regards payable gold, and I trust it will not be very long before the part of the country I have indicated will be subjected to a more thorough and searching examination, than, in the short time and with the small means at my disposal, I was able to give it. Intending prospectors must, however, be prepared to expend and perhaps lose money; but the appearances are quite good enough to justify this risk.

“EDWARD T. HARDMAN, *Government Geologist.*”

No idea of gold-mining in Western Australia seems to have existed in the colonial mind until the publication of the foregoing report. Then another bad attack of the gold fever set in. I say *another*, because in bygone years this unfortunate colony lost thousands of colonists, who ran off to Victoria when the epidemic broke out, and never returned. But the worst of it was, she had in many instances actually paid the outward passages of these ungrateful immigrants.

The disease has attacked each of the Australias in turn. First New South Wales, then Victoria; then South Australia, with a moderate seizure at Euchunga. Snowy River, New South Wales, was seized with the malady; Gympie, Queensland, a severe dose; then New Zealand, and then Tasmania—the latter a mild attack. The epidemic raged for a while in the Northern Territory, South Australia, and lastly we are brought to Kimberley, where first floated in Western Australia air the *bacilla aurifera*.

Had the fever taken a specially virulent form in this colony it would be small wonder. Read the following Government proclamation:—

“GOLD! GOLD!! GOLD!!!

“WESTERN AUSTRALIA,

“COLONIAL SECRETARY'S OFFICE,

“PERTH, 2nd September 1872.

“WHEREAS gold in small quantities has been found in various parts of Western Australia, it is hereby notified, for general information, that the Local

Government of Western Australia offer, as a reward for the discovery of a workable goldfield within a radius of 300 miles from any declared Port in the Colony, the sum of £5000, upon the following conditions:—

- “ 1. That such reward be not payable until 10,000 ounces of gold, either alluvial or crushed from quartz, and obtained from such goldfield, be entered and cleared at a Customs House at some port in Western Australia, and actually shipped to Great Britain, within a period of two years from the date of the registration in the office of the Colonial Secretary of the exact position of such goldfield.
- “ 2. That the Governor of the Colony for the time being in Executive Council do finally adjudicate and determine to whom alone, or if there be several claimants, to whom and in what proportions the above reward shall be payable and paid.

“ By Command,

“ FRED. P. BARLEE,

“ *Colonial Secretary.*”

This reward, I may mention, was claimed by Messrs. Hall and Slattery, besides various other applicants, and has been the occasion of much litigation and heartburning.

The Kimberley goldfield is situated in the north-

eastern corner of Western Australia, and its principal diggings are near the eastern boundary of the colony, about 200 miles from Wyndham, on Cambridge Gulf, and 300 miles from Derby on King's Sound.

The official centre of the field is at Hall's Creek, which is connected with Derby by a telegraph line which gives telegraphic communication with Perth.

Every three weeks or so, the Adelaide Steamship Company's steamer, which runs between Cossack and Port Darwin, calls at Derby and Wyndham. The district is thus connected with the southern portions of the colony, while the Eastern colonies and Singapore can be reached *via* Cossack, and the north-eastern colonies *via* Port Darwin.

The road between Wyndham and the field is pretty good, and is well watered, with the exception of a dry stretch of 40 miles.

The following particulars are abridged from the Government report of the field:—

### PANTON.

**Caledonian.**—This is a lease of two acres, and is situated on a small creek, about four miles north-east of the point where the telegraph line crosses the Panton River.

The rocks on this area are mostly clay slate, but there are also beds of mica slate and veins or beds

of calcite; their general strike is a little east of north, whilst they dip to the west at a high angle.

The quartz, which is of a rather glassy dark-blue or mottled appearance, is from 6 inches to 1 foot in thickness, well defined, with a strike of north  $35^{\circ}$  east, whilst it dips in a westerly direction.

A large number of small shafts have been sunk, the deepest of which is 50 feet, but so much water was encountered that it was found impossible to sink deeper. The water was struck at 25 feet, and is perfectly fresh.

Up to the present no trial crushings have been made, and as the deep shaft is now used as a well, and the other workings are unsafe, it is impossible to say anything about this reef in depth. Should the stone, however, prove rich when crushed, in spite of the small size of the reef, it would be worth opening up further, as from its well-defined surface, character, and length of outcrop it is almost certain to go down, and will probably increase in size.

**The Comet** is one acre in extent, and lies about 33 chains to the north-east of the last mentioned.

The shaft, which is partly vertical and partly on the underlie, is 55 feet in depth, and has been sunk on a small leader on the western side of a large quartz blow.

The leaders, or cross-courses, vary in size, the one worked being about 2 feet wide at the bottom of the shaft; but sometimes in sinking it was smaller, although good-sized bunches of stone were met with.

The stone is similar to the Caledonian, but is

more iron-stained, and the rocks dip at a high angle to the westward.

A very nice patch of stone was struck at the surface, and 1 ton 14 cwt. picked from it yielded 134 oz., but the stone has been so well picked over that it is now difficult to find even a colour in any of the stone at the surface.

This is not a true vein, but an offshoot from the large body of stone to the eastward, but still may be found to go down for a considerable depth, varying greatly in size, and from time to time rich patches of stone will probably be met with, and certainly its junction with the main reef should be prospected.

**The Panton Queen.**—From the Comet a series of reefs run in a north-easterly direction, where an area has been taken up and one of the reefs prospected under the above designation.

There are two shafts on this area, the first of which is vertical, about thirty feet deep, on a gossany and iron-stained reef, which is from two to three feet wide in an indurated mica slate, without well-marked wall, whilst the other is about 60 feet, mostly on the underlie.

The stone from this shaft is highly mineralised, and a good quantity of stone has been raised, which, although not showing much gold, may crush well. If it does, this area will certainly be well worth further testing, for although the reef is a good deal broken near the surface, it will probably make into a good well-formed reef when it is traced down into the solid ground.

**The Brockman King.**—This same line of reef continues on to the north-east, in which direction, at ten chains distance from the last mine, another area of one acre has been taken up, on which a shaft has been sunk 70 feet on the reef all the way down, which here dips nearly vertically.

The stone is very similar to the last mentioned, but is only from six inches to one foot in thickness, although from the appearance of the stone from a depth which has a good casing on it, the reef must be well formed, and has probably good walls.

Some small specks of gold are visible in the stone, often amongst green stains of copper, which seems to point to the fact that it will be found associated with iron and copper sulphides in depth. There are also some crystals of talc in the stone.

This has not been tested yet by a crushing, but from its appearance will probably crush well; and as it is the northern extension of the Panton Queen reef, and is well defined, it will be probably found to go down, and also to increase in size.

**The Lady Kimberley** is one acre in extent, and is situated on a parallel line of reef, about twenty-four chains to the westward of the last mentioned area.

This reef is well defined at the surface, although very variable in size, being from 6 feet to a few inches in width along its outcrop. It contains less galena and copper pyrites than the Brockman, but is a good deal iron stained.

There are two shafts, one of which is 35 feet in depth, where the reef is from 4 to 6 feet in width,



whilst in the other, further north, which is about 15 feet in depth, the reef is about 1 foot wide.

The stone is a darker blue, less glassy, and does not contain so much mineral as the other line, but is very nice-looking stone, and the reef gives every indication of going down.

Should the stone already raised prove rich when crushed, the owners should be encouraged to continue further operations.

**The Scottish Chief.**—This lease of one acre is supposed to be on the same line of reef as the last, about 32 chains to the south-west, and on it a shaft has been sunk to the depth of 60 feet.

The reef here is about 1 foot wide in the shaft, but pinches to about six inches towards the south end of the claim.

There is another line of reef a little further to the eastward, the stone of which is far more like that of the Lady Kimberley. This was in the original claim, but has been left out of the present smaller lease. On this reef a shaft has been sunk 50 feet, and in it the stone is about 1 foot in width, and appears from its character to be a continuation of the main line of reef.

Both these reefs are well defined, but small in size, and although no gold is visible in the stone about the shafts, very rich stone is said to have been obtained; and as there were rich patches of alluvial, where these reefs were cut by the gullies, it is probable, that if it is found to increase in size, in depth, that it will be well worth working.

**The Star of Kimberley.**—This area measures two acres, and lies to the south-west of the Scottish Chief. It is supposed to be situated on this same line of reef, which here is about 4 to 4 feet 6 inches in width.

The stone is banded, and contains copper and iron pyrites, blue and green carbonate of copper, and galena.

There are three shafts: the deepest, sunk for 60 feet in blue shaley slate, dipping slightly to the westward, the reef being about the width of the shaft, and is well defined at the surface, but what it is like in depth it is impossible to say. The other shafts are of slight depth, and there are also several pits and trenches.

From this claim one ton was crushed, which yielded 16 dwts. of gold, but it is probably much richer than this, the loss of gold being due to the quantity of copper pyrites and galena.

The appearance of this reef and stone is very promising, but trouble is sure to be experienced if special machinery is not put on the claim.

The six last-named areas, with another called the Lone Star, have now been successfully floated as a company in Melbourne, under the name of the Panton River United Gold-mining Company, and machinery is now on its way to the field. The machine area is situated on Grant's Creek, at the point where the Star of Kimberley line of reef crosses it; and as the creek bed was very rich below this point, it is highly probable that good stone may be struck upon it.

A large supply of water will be obtained at a very slight depth, and there is abundance of wood near at hand. It is to be hoped that this company will give these reefs a fair trial, and that their enterprise will be rewarded, but the manipulation will require special care.

**The Perseverance**, about one mile to the westward, is abandoned. It was taken up on a large quartz blow, which strikes east and west. It seems to follow the same line as the large lines of reef, which are seen on the same plain to the north-east.

A shaft has been sunk to a depth of about 20 feet, the stone from which is dark blue, but very gossany and iron-stained. The reef is about 40 feet thick at the surface, but has not been cut through or tested below. The stone is very solid, but a good deal mixed with partings of talcose slate, a crushing of which yielded 30 ounces of gold from 5 tons of stone.

This is rather interesting from the fact, that it proves that both the reefs that follow the strike of the country and the cross courses carry gold.

### HALL'S CREEK.

**Jackson's Reef.** — This area is abandoned, and the reef has been tested by a shaft 70 feet in depth, where it was 1 foot 6 inches near the surface,

but pinched out at a depth of 50 feet, being very rich in places. The vein strikes north and south, dipping nearly vertically, but a little to the eastward. It is not a true vein, and cannot be traced for any distance at the surface, as it cuts out entirely in a trench about 20 feet south of the shaft.

The country is a hard blue slate, with small veins of quartz, and the water-level is here about 70 feet from the surface. There is another reef to the eastward, which carries no gold. Several other shafts have been sunk on this area, but no reef has been struck, although there was a good show of quartz at the surface, which carried a little gold.

From this area 78 tons of stone were crushed, which yielded 56 ozs. 18 dwts. of gold.

**The No. 1 South Jackson's.**—This is an abandoned area, a shaft having been sunk to a depth of 70 feet; but there is no true reef, only some very small leaders, carrying a little gold, the rock being chloritic slate with calcite veins.

**The No. 1 North Lady Broome (late Homeward Bound).**—On this abandoned area, a small reef from 1 foot 6 inches to 2 feet in width strikes east and west, and dips at a high angle to the southward. The stone is of a whitish granular quartz, with galena and gossan in a greenish hornblende slate, with iron stains and manganese on the cleavage planes.

About 6 tons of stone were crushed, which yielded 4 ozs. 3 dwts. of gold.

**The Lady Broome.**—On this lease of 25 acres

there are two shafts 70 feet in depth, connected at the bottom, which is the water-level. One of these shafts is partly vertical and partly on the underlie of the reef, which strikes here across the country, underlying to the south, and is from 2 to 4 feet in thickness, the stone being white and iron-stained, but it contains no galena. Of this stone 400 tons are said to have been crushed, which yielded 30 ounces of gold.

**The No. 2 South Black Mount.**—On this claim an underlie shaft was sunk 70 feet on a small reef dipping to the east, in which some very rich patches of gold were found.

On the top of the hill there is a large reef of a bluish iron-stained quartz, which contains a little copper.

**The Gladstone.**—This area is in the immediate neighbourhood, but there is no defined reef. Two tons of stone crushed yielded 3 ozs. 17 dwts. of gold.

**The Jubilee.**—A little further south, on this same line of country, is the only area still held. It is 6 acres in extent, but is not at present being worked, on account of the scarcity of water.

The reef is at the head of a long gully, in which one of the richest patches of alluvium was found. It strikes east and west, dipping to the north, and is from 4 feet to a few inches in width.

There are three shafts, the No. 1 being 65 feet in depth, with a drive along the reef to the westward. From this point it is connected by a rise

with the bottom of the No. 2 shaft, which is 40 feet in depth, and from the bottom of that there is a drive to the southward. At the bottom of the 65 foot shaft there is a north and south cross course, cutting the reef, which latter is very rich just here, particularly on the north side; it is also rich along the drive to the bottom of the 40 foot shaft.

Most of the work has been done on either side of the 65 feet shaft, near its junction with the cross-course, and by picking the stone; it has, up to the present, paid expenses. The stone is a nice-looking quartz, often containing a good deal of galena and pyrites, 9 tons 17 cwt. of which have been crushed, and yielded 403 oz. 13 dwts. 12 grs. of gold.

## THE BROCKMAN.

**The Golden Crown.**—On the main line of reef, towards the north end of that portion of the field known as the Brockman, this lease of 24 acres is now being worked.

There are two shafts 60 feet apart, the one at the south-east end being 70 feet in depth, and the other about 50 feet, whilst the ground between them has nearly all been stoped for a width of about 5 feet. This lode has no defined walls, but consists of a broken mass of veins and leaders, intermixed with the country, which is a greenish blue sandy slate, striking north-north-east and south-south-west, and dipping

at a high angle to the north-west, intersected by many cross veins. This body of stone goes down nearly vertically, some parts of it being very rich, but the returns were much reduced by the quantity of non-gold-bearing stone and country that was crushed; 1000 tons are reported to have yielded about 1250 ozs. of gold, but had this been sorted the result would have appeared much better.

On this area there are a ten-head stamper battery, two boilers, engine, pans, pumps, &c., the whole connected with the mine by a tramway, but at the present time it is not in working order.

The well is a little outside the boundary of the area; it is about 50 feet in depth, the water is good, and rises to within 30 feet of the surface, but the supply is only sufficient to work the battery for twelve hours continuously.

**The Lady Margaret.**—This claim is about 24 chains to the westward of the Golden Crown, on the western side of a large quartz reef, which follows the main line of the country, which here runs north and south. The reef worked is a small leader, which strikes west-north-west from the main reef, and dips to the southward. It varies in size from 2 inches to 3 feet, is well defined, and was exceedingly rich.

It was worked by two shafts, the eastern one being 60 feet in depth, whilst the western one is 50 feet. They are connected with one another by a level, from which another small shaft has been sunk 18 feet, and it is at the bottom of this that the reef attains its greatest size.

Although small, this reef was very rich, as 97 tons of stone yielded 251 ozs. 14 dwts. 19 grains of gold ; but, unless it is found to be rich enough to work at the western end, where the reef is increasing in size, it will never pay to continue the workings to any great depth on so small a vein.

**The No. 1 Lady Margaret North or Hardman's Hope.**—This abandoned area joins the Lady Margaret to the northward, and it has been tested by three shafts which have been sunk, one of which is an underlie to the eastward 80 feet in depth, and two vertical, one 23 feet and the other 37 feet.

From this area 20 tons 10 cwts. of stone were crushed, which yielded 16 ozs. 6 dwts. 12 grains of gold.

**The No. 5 Lady Margaret North.**—This forfeited area was to the northward of the last-mentioned, and four small shafts along the line of reef, which appears to be a good size ; but as the shafts are unsafe, it was impossible to examine it below.

Six tons 10 cwts. of stone were crushed from this area, which yielded 9 ozs. 6 dwts. of gold.

**The Afghan Crown—Part of the Lady Margaret South.**—This lease of 5 acres is to the southward of the Lady Margaret, and there is a reef which varies from a few inches to 6 feet in width, striking a little east of north, and dipping to the eastward. A shaft has been sunk to the eastward to a depth of 40 feet, but it has not cut the reef, but will probably do so at about 50 feet.

The stone is gossany, and forms a large mass or



blow to the northward end of the area, following the course of the dyke which was cut in the Lady Margaret drive.

A crushing of 64 tons of stone taken from the surface, where a series of small leaders outcrop, yielded 48 ozs. 8 dwts. of gold.

**The Brockman King.**—This area is a little to the south-west of the Afghan, but is now abandoned.

A shaft was sunk about 30 feet on a solid quartz reef about 3 feet in width, in which there is a good deal of mundic.

Some very rich specimens were obtained from this claim, but the stone generally does not show gold.

**The Southern Cross.**—To the south-eastward of the Brockman King there is an area of 10 acres, on which two lines of reef have been tested.

On the eastern line of reef there are two shafts: the northern one is 25 feet in depth, showing a reef from 1 foot 6 inches to 2 feet in thickness, and is intersected by some cross leaders. Further south there is another shaft 15 feet in depth, with a drive along the line of reef, the stone of which is about 2 feet in thickness, dipping very flat at the surface, and is grey, gossany, and much iron-stained.

On the western reef, at the southern end, a shaft has been sunk 50 feet, following the stone all the way down, which is from 2 feet to 2 feet 6 inches in thickness, and is well defined, but much more iron-stained than the eastern reef, whilst the country is here sandstone. Further north are some small workings on a small reef, the stone from which is much

whiter, very variable in thickness, but shows a fair formation when opened up. A crushing from this area yielded 3 ozs. 5 dwts. of gold for 5 tons of stone crushed.

**Mount Davis.**—A short distance due east from this last-mentioned area there is a lease of 6 acres, but no work has yet been done upon it, and no reliable information could be obtained as to what prospects had been obtained.

**The Mount Bradley Tunnelling Claim.**—This area of 30 acres is a little to the north-east of the last mentioned. It is held as claims, and reward claims in consideration of certain prospecting having been done by tunnelling.

The reef is large, well-defined, and forms the main ridge in this part of the country, running north and south from the Ruby to the Golden Crown, and attaining an elevation here of about 200 feet above the surrounding country.

A small shaft has been sunk on the western side of this reef on a small leader running off from the main reef in a south-west direction, which was very rich in gold.

Further to the northward, on the western side of this hill, a large body of stone, from 12 feet to 14 feet in thickness, has been worked to a depth of 30 feet. It is well-defined, with good walls, particularly on the eastern side, and was very rich in gold, the shoot dipping to the northward.

On the eastern side of the hill, a tunnel has been driven into the hill for a distance of 320 feet; it

cuts the reef at about 110 feet in depth from the surface, a little to the south of the last-mentioned workings, and between them and the main shaft.

From this mine 789 tons of stone have been crushed, yielding 810 ozs. 9 dwts. 15 grs. of gold; but, in spite of this good return and the cheapness with which this mine can be worked, it is at present in liquidation; but this, it must be clearly understood, has nothing to do with the mine, which should be an exceedingly valuable property.

**The Phoenix (late Lady Carrington).**—This area of 6 acres is on the same line of reef further south, on the hill the other side of Butcher's Gully. There is a large outcrop of quartz here, a large quantity of which has been got out ready for carting, and a good road constructed up the hill to the workings from the battery site.

The reef appears to be about 20 feet in width, and is a whitish quartz much iron-stained and gossany; no gold is visible, but some small trial crushings are said to have yielded very satisfactory results.

**The Faugh-a-Ballagh.**—This area of 5 acres is situated at the extreme north of this line to the northward, on the same line as the Golden Crown.

Some small shafts have been sunk, and a trial crushing of 6 tons of stone taken out, which yielded 6 ozs. 5 dwts. of gold.

## THE RUBY.

**The Ruby Queen.**—This lease of  $6\frac{1}{2}$  acres is upon the main line of reef of the district ; and from the fact that this was the first mine worked on the Ruby Creek it has been called the Ruby Line ; the various leases taken up north and south being commonly known as No. 1 North or South, &c., as the case may be.

This reef forms the main hill ridge of the district, attaining an elevation on this area of about 350 feet above the surrounding country. This fact will greatly reduce the cost of working, as a great part of it can be worked by drives and tunnels.

The reef has been worked on the eastern side of the hill, at the head of a small gully, about 138 feet from the top of the ridge, by two drives along its course, one north 265 feet and one south 160 feet ; also by a shaft in this gully 55 feet in depth, where the reef was found to be a good deal broken, and to have pinched out to a small body of stone.

In the north drive the lode is from 4 to 8 feet, and is well defined between good walls, the country being sandstone and clay-slate, dipping west. It has been stoped in places to the surface. There is also another level above this one, and to judge from these two the shoots of gold will dip to the northward.

In the south level the lode mass is rarely all

quartz, but consists more of a mass of leaders, the largest of which are about 2 feet in width, intermingled with broken country.

About 2000 tons of stone have been crushed from this mine, which is said to have yielded 1500 ozs. of gold.

**The No. 1 North Ruby Queen.**—This lease of 4 acres is situated on the same line of reef immediately to the northward, and the reef has been tested on the top of the hill at its outcrop by a shaft 45 feet in depth on two leaders on the hanging-wall side of the main reef, which are, when taken together, about 3 feet thick in width, and are very rich in gold.

Another shaft has also been sunk to a depth of 60 feet, in which the reef is about 6 inches in width, and shows gold well in the solid stone. There are also several pits and trenches from which good stone has been raised, and up to the present all the working expenses have been paid by the gold obtained from this area.

**The No. 2 North Ruby Queen.**—This was a lease of 6 acres joining the north side of the No. 1, but running a little further to the westward. The main reef passes through this area, and a small shaft has been sunk, but it has now been abandoned.

The Scandinavian Claim joins this area to the northward, and is a little more still to the westward, but this is now also abandoned.

**The Pyramid, or No. 3.**—This lease of 3 acres is the next on the main line, but it has not been tested,

for the tunnel which was driven into the hill on the western side following a small leader, was not extended far enough to cut it. It is now abandoned.

**The Union.**—This claim is 400 yards by 400 yards in extent. It adjoins to the northward of the last mentioned.

The main reef has not been tested, but a small shaft has been sunk on some leaders on the westward side of it.

These leaders were then followed by a drive to their outcrop, on the side of the hill, a distance of 60 feet from the bottom of the shaft through a soft white slate, but this leader proved too small to be worth working.

**The West and Left, or No. 4.**—This lease of 7 acres 1 rood and 15 perches joins the Union on the north side, and towards the south end a cross leader, which strikes east and west, dipping south, and from 1 foot 6 inches to 3 feet in width, has been tested by a shaft to a depth of 70 feet.

At the surface this leader seems to make in size towards the main reef, which is to the eastward of it, and to pinch out towards the west. At the 40 feet level in the shaft the reef takes a turn and runs north-west and south-east down the shaft, whilst another leader from 1 foot to 2 feet 6 inches, running east and west, was cut here. These two join at the bottom of the shaft, making together about 3 feet of stone, and a trial-crushing yielded about 3 oz. to the ton.

The central shaft is about 20 feet, and was sunk

on some leaders which follow the strike of the country, but the stone was not so rich here.

The north shaft is closer to the main reef, to the north-west of the latter, on an east-and-west leader, which goes down nearly vertical. It is 108 feet in depth, which is about the water-level here.

At the 60-foot level there is a drive 30 feet west, where the reef is 1 foot 6 inches, and 50 feet east, where it increases from 2 feet 6 inches to 3 feet; it has a well-defined north-wall but no south wall.

At the bottom of this shaft is a well-defined body of stone about 3 feet 6 inches in size. The stone is dark-blue, much iron-stained, and shows gold freely in crushing. It yielded 1 oz. and 15 dwts. of gold to the ton.

Altogether 189 tons of stone have been crushed from this mine, which yielded 376 ozs. 18 dwts. of gold.

**The Goliath, or No. 5.**—This lease of 8 acres joins the west and left to the northward, but no work worth mentioning has been done, and it has now been abandoned.

**The Ruby Queen Extended North, or No. 6.**—A lease of 15 acres under this name was taken up to the northward of the Goliath, but it was not worked, and has been abandoned.

**The Triumph.**—The situation of this area of 2 acres is at the north-east corner of the last mentioned, and the reef prospected is a parallel line about 6 chains to the westward of the Ruby Queen line.

A small shaft about 15 feet in depth has been sunk, with a small level at the bottom along the reef, which here strikes a little east of north, dipping slightly to the westward. The stone is not so dark in colour or so iron-stained as that from the main line, but is about 4 feet in thickness, showing gold. It is a well-defined reef, and shows at the surface for a considerable distance.

**Sunny Corner.**—This lease of 2 acres is to the north of the latter, on the other side of the Creek, where a small cross leader has been worked by a shaft which has since fallen in.

About 18 or 20 tons were crushed from this shaft, and are said to have yielded about 60 ozs. of gold.

This reef is probably an offshoot of the Triumph reef.

**Rising Sun, or No. 7.**—This lease of 12 acres is on the main line to the northward of the Ruby Queen Extended North, on the opposite side of the Creek, and to the eastward of the Sunny Corner.

The reef is the main Ruby line, and has been tested near the battery, where it crosses the creek, a trial crushing of 20 tons yielding 8 ozs. of gold.

The main workings are on the top of the hill, more to the northward. The first shaft is called the prospectors' shaft. It is about 60 feet in depth, with stopes on either side; the reef dips west, and is well defined between sandstone and clay-slate walls, showing well in an open cutting, being from 1 foot 6 inches to 3 feet in width, and some very rich specimens were obtained.



The central shaft is a little more to the westward, and is about 50 feet in depth, with a level at 40 feet connecting it with the original working, and also with the north shaft. The north shaft is about 50 feet vertical; then follows down the reef on the underlie for another 40 feet. At the bottom of the vertical a large mass of very rich stone was struck, about 13 feet in width, but below this level the stone decreased in size, making again at the bottom of the underlie into a large body, but the stone is not so rich.

The stone is of a light colour, and a good deal iron-stained. A crushing of 500 tons is said to have yielded 437 ozs. of gold.

There is a ten-headed battery, with amalgamation pans on this area, with a dam and well, which latter is 60 feet in depth. The water is good, and rises to within 30 feet of the surface, yielding 3400 gallons a day, but the supply could be greatly increased by deepening it, as in 20 or 30 feet the main reef will be struck, when a large supply of water is sure to be encountered.

**The No. 8.**—On this area, which is now abandoned, there are two shafts, one 70 feet and the other 60 feet in depth. They are 50 feet apart; and a leader 1 foot in width, rich in gold, is said to have been cut in the 60 feet shaft, but the main reef is a good deal split up at this end.

**The No. 9.**—On this abandoned area there is an underlie shaft 20 feet in depth, with a cutting at the south end. There is also a vertical shaft 25 feet,

both of which are supposed to be on the same leader as worked in No. 8.

**The St. Lawrence.**—This lease of 5 acres 3 roods and 36 perches was taken up on a branch reef which runs away to the westward from the west side of the Ruby Queen lease. This has been worked to a depth of 36 feet, and the stone, which is from 3 to 4 feet in width. It strikes in a north and south direction, turning sharp to the eastward at the south end.

The stone is dark and gossany, showing gold freely, a crushing of 233 tons having yielded 277 oz. 10 dwt. of gold.

I need scarcely particularise the **Lady Hopetoun**, which consists of the *Victoria United*, the *Hard Labour*, *M'Neil's Fifty Feet*, and *Black Prince*, all of which have yielded good results, on either assay or trial crushing.

Besides the claims thus enumerated there are the **St. Lawrence Extended South**, the **Ruby Queen South**, and the **Ruby Queen Extended South**, which have all been abandoned.

Some estimate may be formed from the foregoing recital of the extent of the great Kimberley goldfield. When we consider that it is 150 miles in length, and is well supplied with both timber and water, it is safe to predict that when Western Australia is appreciated at her true value as a great mineral country, the rich lodes in this remote district will be fully opened up and efficiently worked.

No field in the colony has been more neglected and misrepresented. The first to be discovered, it

was the object of a feverish rush. Small capitalists, without practical knowledge, flung away their money in rash and fruitless speculations. Then came a reaction, with debt, mortgage, and bankruptcy casting their blight throughout the territory.

Still the gold is there, and will remain safely imbedded in the distant reefs of Kimberley until some future day, when, with confidence restored, brains and money hand-in-hand will bring to light her gigantic golden treasure.

## GREENBUSHES TINFIELD.

OF course in the presence of gold all other metals sink into insignificance. This is not for any practical use to which it can be put; for unalloyed, it is unavailable for almost any purpose except perhaps filling teeth. But then it is the money standard of the world. Hence at its will the iron glows and assumes a thousand forms, ploughing through the seas and spanning rivers, while the broad axe and the flashing sword shape the destinies of nations.

But how about modest tin? I have already said it existed in axes and swords centuries before the uses of iron were known at all.

Its scarcity of distribution on the world's surface is notorious, and has already been referred to, and I cannot help noticing the singularity of the circumstance that England should have been so favoured, and that her own colony on the opposite side of the earth should have revealed her stores of tin thousands of years afterwards. Many would be almost inclined to think that the vein ran right through from Cornwall to the north-west of Australia. But an eight thousand mile lode will scarcely be accepted by the geologists of the British Association, so I will not

attempt to advance the theory. Tin has been found here, and that is the main point. And now as to its discovery.

The above-named field has a proclaimed area of 50 square miles. The metal was discovered, at the end of 1888, by D. W. Stinton. The main road between Bunbury and Bridgetown crosses the field diagonally, the centre being 53 miles from Bunbury and 9 from Bridgetown. The highest point of that portion of the Darling Range occurs somewhere about the centre of the field, from which all the rich leads or gutters radiate.

The tin wash of the field varies greatly in richness, thickness, and quantity, running from 3 oz. to 15 lbs. to the dish in the latter, and from 6 inches to 20 feet in the former, the low percentage washes being in larger quantities, and as a rule much freer than those of a higher percentage.

There are also several springs and swampy patches, which are evidently fed from the older water-courses, where the tin-deposits are found. The whole of the surface of this field is covered with a modern formation of ironstone gravel, beneath which the leads run, and until prospecting has been more fully undertaken much will remain undiscovered. No lodes have yet been found, but from the crystalline and unwater-worn character of the tin, it may be inferred that they do exist. These will probably be in the form of stock-works, in which form the metal occurs in the principal continental mines, where they are found as a network of thin veins

or strings of crystals interlacing through a decomposed granitic dyke, all of which are usually found rich enough to work.

At the present time a good many claims are being worked, and as the deposits admit of very simple handling, and the supply of water ample, it would appear likely that profitable occupation will be found here for several years to come.

It is discouraging, however, to find how hard the legislative enactments have pressed on the pioneers of the tin industry. I reproduce the letter of a correspondent of the *Southern Times*, which intelligently deals with the question, and gives a little news from Greenbushes. He says—

“Local news of general interest is very scarce on the tinfields; but the arrival of the Registrar, Mr. R. Gibbons, J.P., has awakened miners to the fact that they must put their hands in their pockets and provide themselves with licenses, otherwise they cannot represent ground under the new Mineral Act. The Act has caused some little discussion here, but apparently the fees—notably for business licenses and for-exemption from labour—are considered exorbitant. I understand a petition to have the business licenses reduced from £4 to £1 per annum is being got up. It is said that in New South Wales the license is only £1 per annum, and Greenbushes has not yet proved to be a Broken Hill with a population of thousands. It is considered a hardship that people here who are just existing by selling a few of the necessaries of life should have

to pay such a heavy tax. Then the fee for exemption is very excessive, viz., £1, 1s. per month for a leasehold. Now there are leases which have been worked in a legitimate way since they were taken up, but whose returns do not justify the owners employing more than one or two men, who have to get exemption during the dry season for want of water, and so soon as the rains set in are flooded out. With such as these it will be impossible to get on, as the holder would require to be exempted almost from January to December.

“The Registrar has, I think, created a very favourable impression on the miners. He has expressed himself as being desirous of protecting the miners’ interest to the utmost in his power, provided they will do their part; and when we get into the run of the Act, no doubt things will go smoothly and without friction. General regret is expressed that the Registrar’s Court is to be held in Bridgetown instead of on the field. This will make it very inconvenient to men who may have to leave their work, and perhaps lose their pay, and tramp ten miles for the sake of a few minutes’ business.

“Messrs. Williams & Sons, Walker, Hillyer, and several others, have been driving in deep ground and stacking wash dirt for some months, and at the claims mentioned there are some large stacks of splendid dirt, waiting for treatment as soon as sufficient water is to be obtained.

“I hear on good authority that a Mr. Dunstan, lately from South Australia, is importing, per

ss. *Colac*, now on her way to Western Australia, a crushing mill to treat the tin-bearing stone, which exists in large quantities, notably on the Gladstone claim (R. Williams & Sons). It is here that Mr. Dunstan intends erecting his plant, he having made arrangements with that firm to have all their tin stuff that cannot be worked in the ordinary way of sluicing. It is hoped that this spirited enterprise will be attended with good results.

“Rain is anxiously looked for, but up to the present, beyond a few showers, none has fallen to be of any benefit to the miners.”

And again the same writer says: “The rain holds off very much; it threatens and drizzles, but does not come down hard enough to do much good. Claim holders are looking very anxiously for a good downpour, to enable them to start washing operations. There are several very large stacks of dirt waiting to be treated, and various are the comments made as to the quantity of tin that will be obtained from them. It is impossible to form anything like a correct estimate as to the quantity of tin so stacked until it is sluiced. The prospects of the field are bright and prosperous. There is a good deal of prospecting being done with varying success. I heard to-day of another rich find being made. If the report is correct I trust the expectations of the finder will be more than realised. A portion of Mr. Dunstan’s crushing mill has arrived, and the balance is expected in a day or two. All being well, it will be at work next week. It is a Chilian mill, is of



a very simple construction, and worked by horse-power. A great many men have come to the fields lately looking for work, and are much disappointed when they cannot get anything to do for want of water. Many of them have been told there was 'any amount of work to be had, men are badly wanted,' &c., when such is really not the case. But then there are in all towns some 'know-alls,' who know more about the bush and its residents than we know ourselves. Men are apt to give the place a bad name if they are disappointed in their efforts when they have been led to expect better things."

## WESTERN SHAW TINFIELDS.

NEXT in importance to the goldfields of the North-West district are the Western Shaw Tinfields, where there are several miles of country carrying extensive stream tin deposits.

Surface metal has hitherto formed the chief branch of this industry, but the very fact that this pays augurs well for the future, when the lodes come to be attacked.

The cost of transit and initial outlay are doubtless high, but deposits which average 68 to 70 per cent. of tin are bound sooner or later to attract ample capital.

Messrs. Eley & Company were among the first pioneers in this industry, and have done remarkably good work on their area. Last year they collected some 50 tons, though working with only a few hands, and often at half time, owing to scarcity of surface water. This firm have a lode on their property with a surface show of 10 feet in width, and all the necessary appliances for working the stream tin are on the ground.

Mr. J. Boyer has lately directed his attention to this industry, and seems to have favourable prospects before him.

The great drawback is doubtless the 200 miles which separate the tin mines from the coast. With gold this does not much matter, for obvious reasons: the freight of the precious metal is not much thought of once it is made prisoner.

The Western Shaw Tinfield is situated 200 miles from Roebourne, to the eastward, with a good road all the way. Messrs. Eley's claim consists of a mineral lease from the Government, embracing an area of 40 acres.

The tin which is being raised is the purest oxide (cassiterite) that exists, and fetches a high market price.

On this ground are employed ten draught horses, and there is every appliance for the production of the metal.

The mere matter of distance will not prevent this mine proving a Bonanza when energy and capital are brought to bear on the excellent foundation laid by Messrs. Eley.

**Withnells Tin Lode.**—This property is distant about half a mile from that which I have just described.

There is a well-defined lode running diagonally through the claim, measuring about 2 feet in width, with a dip of about 1 in 4 feet.

It extends over an area of 20 acres, and the country adjoining the foot wall is composed of porphery, the hanging wall being of granite.

By latest accounts the yield has been satisfactory, and prospects of the mine are promising.

## COPPER.

A FEW miles south of Roebourne some copper mines were worked a few years ago. They are situated at the base of some low slate and quartzite hills on the edge of a large flat, formed by one of the branches of the Harding River.

The lodes are chiefly oxides of iron and copper, in some of which gold is often visible. The low price of copper and cost of freight has prevented the development of these mines throughout Western Australia, but if gold could be found in conjunction this would be a strong inducement to work such lodes, since the two metals can be readily separated.

A large quantity of copper has been taken from the Whimwell mine; but, although it is said to have been worked profitably, the work has been carried out on too small a scale to pay well.<sup>1</sup>

<sup>1</sup> The copper mines being at present in abeyance, owing to the low market price of the metal, I have not entered more fully into the subject here. A further reference to the discoveries, however, will be found in the Introduction.

## THE COLLIE COAL MINES.

GREGORY'S discovery of coal on the Irwin River in 1846 I have already referred to, and upon that achievement—notable as it was—I shall make no further commentary. The paramount importance of a coal supply to a mineral-bearing colony is self-evident, for no other fuel can take its place, either for steam-producing or smelting.

This question has, therefore, been anxiously discussed, and towards the end of 1889 David Hay, of Bunbury, discovered coal in the bed of the Collie River. How he came to suspect its existence in that quarter I need not go into; suffice to say, he led a party of men to the spot, some of whom obtained samples from the river-bottom by diving. Some hundredweights were raised in this way, and a portion was taken into Bunbury and burnt publicly on the occasion of a visit from the Governor, Sir Frederick Broome.

Subsequent operations proved the existence of two seams which outcrop in the bed of the river, the first or western one being situated immediately on the eastern side of the Darling range. It must be very near the junction of the coal-bearing formation

with the older crystalline rocks ; but no junction is visible, through most of the surface being covered with ferruginous sandstones and nodular gravel. The second seam is situated about five miles higher up the river to the eastward, or between twenty and twenty-five miles nearly due east of Bunbury. There is very great difficulty in working this coal, in consequence of the shafts so soon becoming full of water. One of the seams is 13 feet 7 inches in thickness, and the quality of the coal is very good ; but, as it is a non-coking variety, it cannot be utilised for gas-making. It is clean to handle, solid, and will travel well without forming dust and smalls. For furnace purposes it is very suitable, forming no clinkers or slag, giving off little smoke, and depositing only a small quantity of ash.

This coal-bearing belt of country appears to run in a north and south direction at the back of the Darling range. To the southward it seems to extend at first in a more south-easterly direction, crossing the Blackwood River from ten to twenty miles to the east of Jayes, and so towards the Franklin River, where it is diverted to the southwest by a bold mass of crystalline rock, through which the river has cut its channel. From this point it follows down the River Tone, crossing Warren, and so on to Fly Brook. It is highly probable that coal seams extend over a considerable portion of this area.

After crossing the Franklin at Yerimniup, another belt of very similar country is met with, which

extends for a distance of twenty miles ; but whether or not coal seams exist here has not been determined. Should it be found in this district, it would prove of special advantage, since the Great Southern Railway runs within a short distance, and a connecting branch could easily be made.

The nearest port for the Collie coal is Bunbury, but the harbour would need to be considerably improved before any large quantity could be shipped.

Water and timber are here in great abundance ; indeed, the former is so plentiful as to be a cause of future anxiety in respect of deep workings.

Here again lack of capital may hinder full development, and it is questionable if the present consumption in the colony would justify the outlay requisite for a full coal-mining plant.

However, here and elsewhere throughout the colony are large deposits of coal, only waiting to be utilised when Western Australia has attained to a fuller maturity.

I append a report on this coal by Professor Etheridge, F.R.S., F.G.S., late Palæontologist to the Geological Survey of Great Britain.

“BRITISH MUSEUM (Natural History),  
“CROMWELL ROAD,  
“LONDON, S.W.

“To BERNARD H. WOODWARD, Esq., F.G.S.,  
“Geological Museum, Perth.

“SIR,—I have carefully examined the three samples of coal handed to me for microscopical examination, and slices of each have been prepared (both vertical

and transverse to the bedding); I have also examined them as to their general character and structure.

“I give hereunder the result in the order of the numbers on the samples sent:—

“No. 1.—This I believe to be a good and true palæozoic coal; it is bright, dense, evenly bedded, and bituminous. This sample is equal to the better class of coals of South Wales and the North of England. Portions of *Glossopteris*, or *Næggerathia*, occur in this coal. This is interesting, as both these genera are abundantly represented and very characteristic of the coal of Newcastle, N. S. Wales; so that we are probably dealing with a coal from the same horizon (geologically) and marked by the same flora.

“The highly carbonised condition of this sample, I doubt not, characterises the general condition of the seam from which it was taken. It burns slowly, but with considerable heat, leaving little ash.

“No woody or *ligneous* structure could be detected, and there is no resemblance to any coal of that type. No spores could be detected under the microscope.

“No. 2.—This sample closely resembles No. 1, but it is hardly so strong or firm a coal, though, apparently, as highly carbonised. The difference is, however, so small that I should have been inclined to believe that both samples came from part of the same seam, merely exhibiting those minor differences of density and quality only ascertained



under combustion. Both these samples consume slowly, with but little smoke. They are both sound coals, and doubtless of palæozoic age.

“No. 3 is a dull, soft, impure, sooty coal, ignites quickly, and burns to a fine ash, giving out great heat.

“This example, although impure, is not a lignite. It resembles ‘Mother-of-coal,’ bands of which often occur in the coal-measure seams, interbedded between thick coals of the best quality. It appears to me to have been taken from near the outcrop, or at little depth from the air. No woody, earthy, or sedimentary matter occurs in this sample, and although far less valuable than Nos. 1 and 2, yet it is quite equal to much of the coal used on the North German Railways, and is (although inferior) a true coal—measure coal and not a lignite. No evidence of ligneous structure could be observed under the microscope.

“It is to be regretted that such very small samples of coal were furnished for examination. Larger pieces would have been much more satisfactory to study.—Yours truly,

“ROBERT ETHERIDGE, F.R.S.”

Since this report was framed, I understand that a firm black bituminous band of coal has made its appearance, and increased to 1 foot in thickness. Moreover, it is stated that it will turn out to be a gas-producing coal. This remains to be seen.

At present I believe £1 a ton is paid by Govern-

ment for coal delivered in the colony, but this is said to be unremunerative to the contractors. It is to be hoped that all assistance and encouragement will be given by the authorities, so that this great basis of commercial prosperity may be fully and firmly established.

## A P P E N D I X.

### GOLD EXPORTS.

I HAVE purposely avoided introducing comparative statements and statistics in the course of these pages, partly from lack of space, and chiefly because, as I have stated, the Government returns do not fully represent the quantity of gold won. Nevertheless, the following figures give such undoubted indications that gold-producing is on the upgrade, that I may be excused for setting them down.

Here, then, are the Customs Returns for the last quarters:—

For quarter ending 30th Sept. 1892,	17,492	ozs.	9	dwts.	14	grs.
„ „ 31st Dec. „	15,774	„	12	„	5	„
„ „ 31st Mar. 1893,	16,176	„	11	„	8	„
„ „ 30th June „	23,121	„	0	„	0	„

### GOLD-MINING REGULATIONS.

THE new Gold-Mining Regulations, which came into force on the 1st of November last, do not seem to be received with unmixed satisfaction.

The miners, and newspapers advocating their interests, complain of the absence of any clear definition of "alluvial field." Quartz is specified as meaning anything other than alluvial, yet the latter remains indefinite. Quartz claims have to be registered; alluvial claims are exempt from this requirement. Recently a case was heard in the Warden's Court in the North-West District which turned on this very question, and as wardens are not necessarily practical gold miners, it would be well that the definition should be made unmistakable.

Then, again, there is the vexed question of fees and charges, which still demand revision. Either some of these innumerable imposts should be abolished in the expenditure, or the staff connected with the fields should be increased up to the limits of the direct revenue, so that the country would derive some benefit indirectly.

Then the arbitrary clause, which directs leaseholders to furnish the warden with a quarterly statement of working and proceeds, under a penalty of £10 for non-compliance, is said to be only a temptation to exaggerate or depreciate as occasion suggests. If the Government staff were adequate this information could be obtained by personal inspection. Then the old rule with regard to the granting of exemptions, against which objections have been lodged, is still in force. These must be forwarded through the Warden to the Minister after evidence has been heard in open court. One could imagine that the Warden on the spot could decide more

equitably than his superior at a distance with only documentary evidence before him. In such remote places as Marble Bar or Bamboo Creek, three months would probably elapse between the date of application for, and the granting of, an exemption. This in many cases would mean great injury, and possibly result in the jumping of a claim, unless the Warden chose to use his own discretion, instead of adhering to strict regulations.

The hours of labour required on week days have been increased to eight hours, and four hours on Saturday, for what reason it is hard to understand, six hours gold-mining in the tropics being as much as most men are fit for day after day.

On the whole, the new regulations leave much to be desired; but I will dismiss the subject in the hope and belief that as time goes on, and goldfields develop, the wisdom of experience will appear in progressive legislative enactments.

### THE WATER QUESTION.

I HAVE already referred, in various places, to the serious obstacle interposed by scarcity of water on the goldfields of Western Australia. Until the problem of an adequate water supply is solved, the full development of mining can never be attained. From the time of Eyre, in 1841, to Forrest, in 1871, and again to Lindsay, leader of the Elder

Expedition in 1891—for fifty long years—“no water” is the constant cry of the baffled explorer.

At a meeting of the Council of the South Australian Geographical Society, held at Adelaide, on December the 8th, 1891, despatches from Mr. David Lindsay were read. They have such a direct bearing upon this vitally important question, that I am induced to introduce a short extract from one of them. It is dated November the 21st, 1891, and runs as follows:—

“SOUTHERN CROSS, YILGARN, W.A.

“I regret having to again report that we have been turned from our course for want of water. We left Fraser Range on November 2, all members of party in good health; the camels fresh, free from lameness, but not much improved in condition, as the feed on which they had been spelling was in rather parched condition.

“We proceeded in a north-westerly direction, having three natives as guides, to show us where water existed on the north side of Lake Lefroy. *En route* they took us to a rock-hole, from which we obtained twelve gallons of dirty water. The weather set in very hot indeed. Passed through much dense mallee country, with occasional thickets and salt lakes, some of which we could cross, others we had to go round. The eastern arm of Lake Lefroy we had to cross by making two journeys, taking half a load each time. The country, on the whole, is very good; soil is a reddish loam, some parts more sandy than others, the sub-soil is a good stiff red clay;

patches of grass appear amongst the bushes. Quondongs, sandalwood, acacias, saltbush, bluebush, and cottonbush are the principal stock bushes. Rock, granite with patches of limestone.

“We touched Mount Monger and then went west, according to our own ideas where water should be found, which agreed with where the natives were positive of finding a big water. We reached the creek on which Hunt's Well is situated, and our native guide took us to a native well on the creek bed, where he sat down, saying, ‘Plenty kapi.’ We turned the camels out, there being good bush. Opened the well, but in a few feet struck the pipe-clay bed, over which was a layer of perhaps two inches of gravel, which was wet. During the thirty-six hours we stayed here only four gallons of water was obtained.

“The camels, having now been six days without water—thermometer up to 102 degrees in the shade, and every night since leaving Fraser Range we had camped amongst half-dry salt-bush, which it was impossible to avoid—would not now eat at all, but lay all day in the shade of the bushes. Next day I took the natives up the creek to where another water was supposed to exist; that, too, proved to have vanished, and the boy, shaking his hand in that peculiar way which signifies ‘nothing,’ said, ‘Nothing kapi,’ and knew not where to go to look for water. Presently we saw a smoke some distance away, to which I told the natives to go and bring in any natives they could find. I continued my

examination of the country, finding a dry tank, and then Hunt's slate well, one mile above our camp, but in the same creek channel in which the native well was. This well had fallen in years ago, and certainly gave no promise of water if opened out. At sundown the natives returned to camp, very thirsty, bringing an old man. They told me there was no water anywhere about here. On asking the new arrival, he, pointing all around, said, 'Gebi kuya,' 'nothing gebi,' the word for water now having changed.

"As no dependence was to be placed on Warring, and the natives said there was no water to the north, it was impossible for us to proceed in that direction. When camels refuse to eat they are very thirsty indeed. The only course to pursue was that stated in my telegram to you from Esperance Bay—'go west for water.' Accordingly we started to travel along Hunt's line, visiting the watering-places shown on his map. Dépôt Hill furnished no water—I had sent the natives back, they being of no use to me. At Yerdanie we found a substantially stoned-up well, which we re-opened to a depth of 15 feet, and obtained only seventy gallons in the twelve hours, bailing every two hours. We had now struck a horse-pad, and were following it, Hunt's dray-wheel tracks being occasionally seen, as also the stumps of the trees and bushes (very often the branches lying on the ground still) which he had cut in 1864."

Regarding the same expedition, I quote the words



of a writer who was well acquainted with the circumstances under which Sir Thomas Elder's undertaking was carried out by Mr. Lindsay. After speaking in high terms of the leader, he says—

“None but men who have ridden through the drought-stricken desert can realise the position in which the party were then placed. To the north they had already found the supposed permanent spring at Fort Mueller dry, and over the intervening waste of land they had travelled for hundreds of miles and proved it a waterless tract, and now that the supposed haven had been reached, the spring was found dry, and another 150 miles of waterless waste had to be faced in order to reach Fraser Range. This feat was eventually performed safely, and, after a spell, the party started again from Fraser Range in hopes of finding water in the unexplored country that would carry them through to the Windich Spring. This they were unable to do, and, the camels being unfitted to stand another push for 500 miles, especially in the hot summer months, the leader had reluctantly to steer west to the outside settlements, to let the worn-out camels have the advantage of any tracks or waters that might exist; in fact, Mr. Lindsay had no other course open to follow, and by doing so he was in a position to take advantage of any rainfall or change of country, and to plunge into the unknown regions; failing that the party eventually reached the Windich Spring, on the edge of the unexplored country, and, with that as a depôt, continued the exploration of Block A, and

also worked away to the north and north-east. The Victoria Spring having failed, upset all the original plans for carrying out the objects of the expedition. Subsequent events have proved that Mr. Lindsay has followed the only course possible. Some idea of the state of the country may be formed from the fact that, in the journey of 650 miles from Fraser Range to here, the expedition only came on one natural water that had not dried up; the only water obtainable being supplies conserved in wells. Natives never seen before have also had to make back to these wells; their rock-holes and so-called springs out east being dry, while in the settlements the sheep and cattle are dying in every direction. On one station alone they have lost 20,000 sheep out of a total of 32,000, while some runs have lost every hoof. The expedition is now camped at Cruickshank's station, and the scientific members seem to have had their fill of bush life, having all tendered their resignations. Should their resignations be accepted, they will probably try their luck at the Murchison Goldfields, 14 miles distant. Mr. Lindsay had determined in any case to spell his camels here, as there is plenty of water and fairly good top feed. On his arrival here the leader took his best camel and started for Geraldton, to communicate with the Geographical Society at Adelaide. He was overtaken at Galara Well, two days after, by a buggy going to Geraldton also. His camel was completely knocked up, and he had to leave it in charge of some civilised natives, and came down the rest of the way

by buggy. Mr. Lindsay, junr., was met a day's journey from Geraldton, and the brothers returned together. I hear that the resignations of the scientific members have been accepted, and while the camels are recruiting, a thorough reorganisation of the party will take place, and a fresh start out eastward and northward will be made. Mr. Lindsay appears to be heart and soul in the work. Notwithstanding the very low condition of his camels, he feels sure that a short spell at Mr. Cruickshank's station will at least put a good number of the animals right to do another trip at once. He means to continue a little prospecting for water in likely looking places, and hopes in this part of the country to have more success than he has had in other places. It is to be hoped sincerely that every assistance and facility will be given the expedition in this great adventure, as one cannot imagine the experiences of struggling through dense thickets, climbing hills, and crossing dreary sand, especially when it is not impossible that ere long, if no rain comes, the party will have to repeat their experience of going thirty-five days without finding any water."

I know something personally of the miseries which water-famine entails upon man and beast during my own explorations in this colony, and can well understand the privations endured and dangers faced by Mr. Lindsay during his arduous journey in that waterless wilderness of spinifex and mulga, known as the Great Victoria Desert. The Elder Expedition may be taken as typical, since it was the largest ever

fitted out in the colony, and consisted of forty-three camels and fourteen men.

The following extracts from a private letter, written by W. Whitfield Mills, a well-known surveyor and explorer, are both interesting and instructive.

The letter is dated from Golden Valley, November 25th, 1891, and, after alluding to other matters, the writer goes on to say—

“ We have seen a lot of skits in the papers about the Elder Exploring Expedition. From the fact of my having traversed the terrible desert the party came through, having in 1883 pushed to Fort Mueller in my hour of need, only to find the spring dry, I consider myself competent to express an opinion as to the way Mr. Lindsay has so far carried out the work intrusted to him. I say most emphatically he has done well, and that no man could have done better. You must remember I have been chatting with not only Lindsay but every member of the party, and knowing the interest you take, not only in the party collectively, but individual members, will endeavour concisely to give you some idea of the state of the country. This sandy desert consists of sandhills and sand-rock ridges that occasionally form water-courses, but so small that they die out directly they leave the stony ridges. In good seasons soakages are formed in these water-courses, and in seasons like those between 1870 and 1875, these soakages were often mistaken for springs, and travelling through this desert, even with horses, was comparatively easy work. But let these soakages

or so-called springs once dry, nothing but a succession of good seasons can replenish them again, and travellers can depend on nought save precarious rock hole supplies. That was the state this desert was in, in 1883, when I crossed, the state it is in now, and the state it has been in continuously since I crossed, and I do consider that Lindsay has done well with such a large cumbersome party to cross that entirely unknown portion of the desert to the Victoria Springs; and on finding that dry, or next door to it—'sixty gallons, I think,'—to have landed his party safe at Fraser's Range. You will remember the grand seasons we have had all over Central Australia in the early seventies; what was the result? In the construction of the Port Darwin telegraph line, we had, comparatively speaking, no trouble in finding water, nor had the explorers of that part of 1870. Read the journals of Gosse, Giles, or Forrest, and not once or twice, but many times, they speak of beautiful springs running down the gully for a mile or a mile and a half as the case may be. What are these springs now? Simply dry beds, the waterworn rock alone showing that water had been running for considerable periods. Even here at Yilgarn the soakages were mistaken for springs, and country taken up with the intention of stocking. But, alas! these springs (so called) have proved as unreliable as Fort Mueller or the Victoria. But for the discovery of gold, no white man would be at the present moment at Yilgarn, and the water supply obtained for the infantile settlement is by condensing salt

water, no supply being obtainable from the springs that are so lavishly shown on the West Australian maps. In fact, the whole desert is drought-ridden and it will take two or three seasons like 1871-1873 to make it habitable for even bushmen."

The demand for water is therefore imperative. Where rivers or wells do not exist, water must either be conserved or wells must be sunk. The only other alternative is abandonment. First for drinking, then for domestic purposes, and lastly, for gold washing, water must be forthcoming on primitive alluvial diggings; and it is, of course, essential for production of steam when mining operations are prosecuted on an extensive scale.

From two sources only is water to be obtained, viz., from the heavens above or from the earth beneath, in the absence of natural watercourses or permanent surface waters. Now, for some time past, there has been a constant influx of miners to the newly discovered goldfields at and near Coolgardie. The goldseekers have come from the eastern colonies, from the United Kingdom, and even from America and Canada. The district bids fair to become one of the richest and largest auriferous fields yet discovered on the Australian continent, if not on the globe itself. Already there are said to be about four thousand people in this neighbourhood, and on the Murchison goldfields the numbers are likewise daily augmenting. Steamship companies, whose business was languishing, have acquired a new lease of prosperity in consequence of

the rush which has set in; and from the eastern colonies alone people have been pouring into Western Australia at the rate of about a thousand every month. When the anticipated stream of inflowing population has reached its full strength, a great change may be looked for in the colony; and whether that change will be for the better or for the worse, depends almost entirely on whether capital accompanies the tide of immigrants. The early summer has now set in, and if a sufficient water supply be not forthcoming, a stampede from the fields is inevitable, and the cities and towns will become overcharged with the unemployed. The great hope for the future lies in the Government taking extraordinary measures in the way of well-sinking and tank-making.

Mr. Renou, the Superintendent of Water Supply, has every confidence, not only in the permanent richness of the goldfields of Southern Cross and Coolgardie, but likewise in the feasibility of obtaining and conserving water, if only the right methods are adopted. Coolgardie is naturally one of the most arid districts in the colony, quite devoid of streams or freshwater lakes. If it has to be deserted during the ensuing summer through lack of the "precious fluid"—which, by the way, deserves its title even more than gold does that of the "precious metal"—a severe lesson will have been taught, both to the miners and the Western Australian Government. Mr. Renou reports, from his observations in July, that the water provision in tanks was

altogether insufficient, and that the attempt to sink wells had proved abortive. This is extremely discouraging news, and may mean irreparable loss, privations, and even death to many; moreover, it is indeed mortifying to read of a complete Kaufman boring plant lying useless in the station yard at Southern Cross, wanting only a few minor attachments and some of its piping and casing, which had been lent to mines at work. Stored in the same yard is a Tiffin boring machine, which the Superintendent of Water Supply examined, and tersely remarks in his report, "I found it was complete, and only wanted cleaning." The nature of the average gold miner is perhaps best described by the somewhat ungainly compound word, "happy-go-lucky." He is apt to be "here to-day and gone to-morrow," and during the rainy season he is prone to think that his supply of water will never fail him. It would be well if he could bear in mind the burden of an old song, which runs—

"You'll never miss the water  
Till the well runs dry."

On the Government, however, rests the ultimate responsibility, and it is to be hoped that strenuous efforts will be put forth to do battle with and overcome this appalling danger of the wilderness.



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